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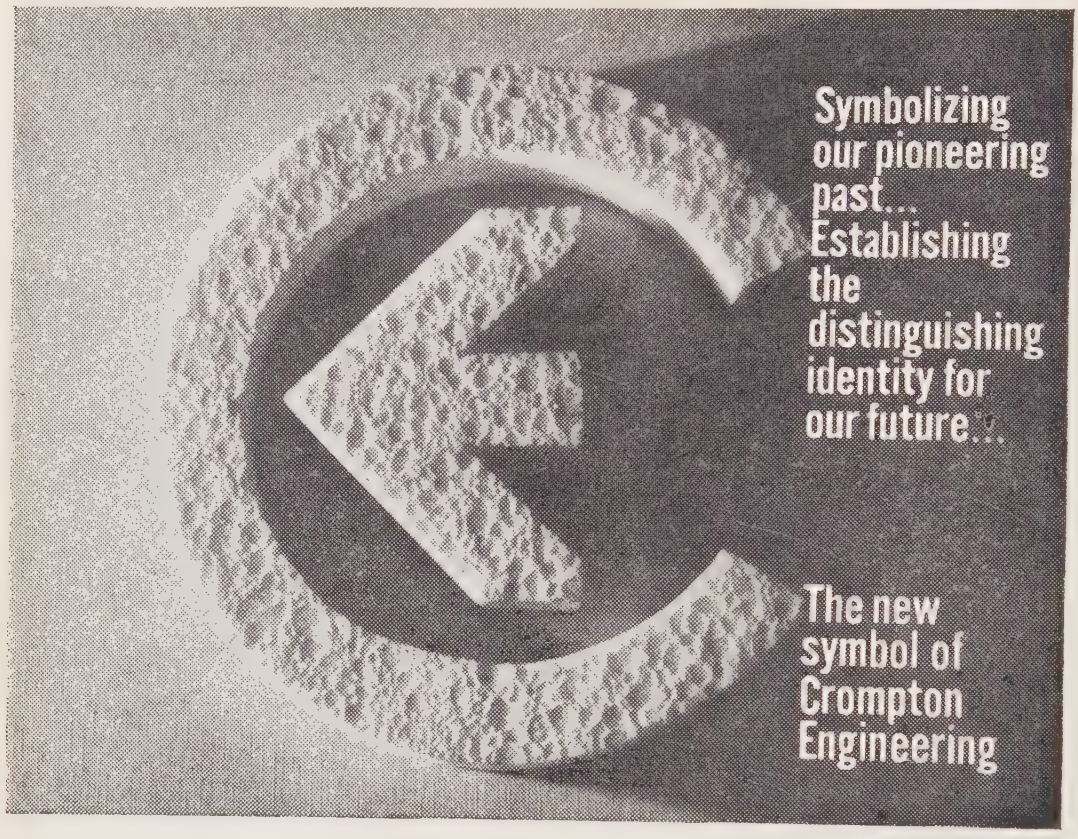
INDUSTRIES IN AND AROUND

AMBATTUR

A COMMERCE FEATURE



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Ambattur industrial complex: A creation of the sixties

By V. RAMAMURTI

AMBATTUR, a small town on the tenth milestone from Madras Central on the broad gauge railway line to Arakonam, was catapulted to industrial fame by the enterprise of Mr A. M. Murugappa Chettiar who established the T.I. Cycles factory there in the early 'fifties and saw it grow to a commanding position in the neighbourhood before he passed away in the early sixties.

The only other large-scale factory—that of Dunlop Rubber Co (India) Ltd—set up in the Ambattur area in 1956-57 for the manufacture of cycle tyres was about all that carried forward during the later 'fifties the industrial momentum initiated by the T.I. Cycles factory. All other large-scale, medium-scale and modern small-scale industries established later in the environs of Ambattur and its industrial estate went into production in the earlier or the later years of the 'sixties. What has now acquired the distinction of an industrial complex was thus created almost entirely during the 'sixties. It is indeed a logical development that ancillary industries feeding the cycle factory and the automobile plants (Ashok Leyland and Standard Motors outside the Ambattur area) constitute a substantial segment of this complex.

Engineering industries are a dominant feature of the Ambattur industrial complex, as will be seen from the accompanying table.

Not all the units figuring in the above classification are large-scale undertakings as described by the Department of Industries. A separate list of such undertakings is given in the *Statistical Profile* at the end. In the following paragraphs are given brief descriptions of some of the major engineering and non-engineering units working in the Ambattur industrial area.

Engineering industry

Tube Investments of India Ltd: Established in 1949, this group consists of T.I. Cycles of India (at Ambattur), The Wright Saddles of India (at Ambattur), Tube Products of India (at Avadi, three miles west of Ambattur) and T. I. Metal Sections, and two subsidiary companies—T.I. Diamond Chain Ltd and T. I. Miller Ltd—at Ambattur. The licensed capacity of the cycle factory is up to 3 lakh cycles per annum. The factory manufactures the principal components for cycles. Saddles, chains and dynamo lamps for bicycles are manufactured by the respective other concerns of the group. Tube Investments of India Ltd has a fully paid share capital of Rs 3.75 crores and its reserves and surplus aggregated Rs 2.43 crores as at the end of 1970.

TVS Group of Industries: To the TVS Group belong several automobile ancillary units situated in the Padi area adjoining the Ambattur Industrial Estate. These units are Wheels India, Lucas-TVS Ltd, Sundaram-Clayton Ltd, Brakes India and Sundaram Fasteners.

Mr Ramamurti is Commerce Correspondent in Madras.

Inside

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LUCAS - TVS LIMITED, PADI, MADRAS 50

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etween them they manufacture ancil-ries such as wheels, starter motors, ynamos, horns, exhausters and com-ressors, brake systems, and high ten-on bolts, nuts and rivets.

Marshall, Sons & Co (Mfg.) Ltd: ncorporated as a private limited com-any in December 1962, the company ommenced manufacture as an ancillary dustry for mining and quarrying equip-ent in April 1963. Subsequently, tech-ical collaborations with three leading ritish manufacturers were finalised in 964-65 and thereafter production of ituminous paver finishers and various zes of stone crushers/granulators and ot/cold mixing plants for asphalt was rogressively taken up. For the first me in the country Marshall-Blawknox aver finisher for mechanised laying of sphalt was manufactured by the com-any in 1967. The paver finisher is a ophisticated equipment in the field of oad construction and a must for speedy nd superior construction of roads, high-ays and airfields. The present installed apacity caters for a yearly production f about Rs 70 lakhs. The company is at resent working in rented premises. onstruction of its own factory building n a 10.20-acre site in the Ambattur ndustrial Estate has already begun and is expected that production activities t the new site will commence by ugust this year.

Sivanandha Steels Ltd: Sivanandha teels Ltd was established to produce uality steel and alloy steel castings. ts factory is located in the Ambattur ndustrial Estate. The Company em-loys about 400 workers and has a ighly qualified team of technical per-onnel. The Company has a sanctioned apacity of 3,000 metric tonnes per nnum of alloy steel and steel castings. he foundry is equipped with a 4-ton lectric arc furnace. It has sophisticated esting facilities for destructive and on-destructive testing like X-ray quipment and ultrosonic equipment, esides a modern chemical laboratory. he factory has helped the public sector ndertakings in their import substitu-ion policy by supplying quality cast-ngs which were hitherto imported by hem. It is specialising in the production f manganese steel and meeting the ull requirements of various leading ement companies for such steel. It has lso specialised in the manufacture of astings required for valve manufac-urers and is supplying quality valve astings for high pressure duty condi-ions. The factory caters to the needs f various Government departments uch as Defence and Railways and of hermal stations and ship-building estab-shments.

Best & Co (Pvt) Ltd: Bests' pump factory in Ambattur is housed in a new, large and well-laid out premises, with sophisticated testing facilities and quality control systems, besides an up-to-date research and development wing to innovate new designs and to develop equipment for special needs. The current Beacon range includes pumpsets for agricultural, general service, water supply, industrial and other applications. Special purpose pumps for petrochemical and refinery applications have also been developed. Not long after their beginning to make pumps, Best & Co diversified further by starting more manufacturing units for such modern and essential equipment as automotive elec-

Types of industries in the Ambattur industrial complex (Year 1970)

Industry	No. of units	Average No. of workers employed daily
Engineering industries :		
Basic metal industries ..	9	1,687
Metal products (except machinery and transport equipment)	25	1,063
Machinery (except electrical machinery)	30	1,620
Electrical machinery, apparatus and appliances ..	14	1,784
Transport equipment ..	18	6,811
Total ..	96	12,965
Other industries :		
Food (expect beverage) ..	5	500
Footwear, other wearing apparel, etc.	4	474
Paper and paper products ..	3	65
Printing and allied industries	1	48
Rubber and rubber products	5	1,705
Chemical and chemical products	7	358
Non-metallic mineral products	1	23
Electricity, gas and steam ..	3	180
Miscellaneous industries ..	13	1,151
Total (other industries) ..	42	4,504

trical equipment for heavy duty, commercial vehicles, passenger and goods lifts, and industrial carbons.

The Crompton Engineering Co (Madras) Ltd: A complex for the manufacture of all types of generating station busducts, switchboards and panels—an important step in the expansion programme of Crompton Engineering—went into operation at the Ambattur Industrial Estate on the 11th February 1971. The unique thing about this unit is that it produces isolated phase busducts which were hitherto completely imported. This manufacturing facility will ultimately handle sophisticated and engineered products with export potential, besides those for the home market. The present manufacturing range includes busducts of all types, from isolated phase bus to inter-leaved low impedance busducts, control and relay panels, metering panels, control kiosks and switchboards.

India Forge and Drop Stampings: This undertaking, established in 1961-62, is a major engineering unit located in the Ambattur Industrial Estate. It has an installed capacity to produce 7,200 tonnes of steel forgings and drop stampings and 240 tonnes of non-ferrous stampings per annum. It has a workforce of 820.

Southern Switchgear Ltd: Established in 1962-63, the company is located in the Industrial Estate. It has an installed capacity to produce 2,400 low-voltage switchgears, 2,400 busbar chambers, 6,000 motor starters and 6,000 iron-clad switches per annum.

Omega Insulated Cables: This enterprise, established in 1960-61, has an installed capacity to produce 45 million core yards of PVC and VIR cables, 280 miles of paper insulated power cables and 3,000 tonnes of ACSR and AA conductors.

Rubber products industry

Dunlop India: The Dunlop Rubber Factory, established in the 'fifties at Ambattur, is outside the industrial estate. It is the third largest single manufacturing unit in the area in terms of labour employed, the first and the second places being claimed by the T.I Cycles factory and the Lucas-T.V.S. factory, respectively. This unit has an installed capacity to produce more than 4 million cycle tyres, 2 million butyl cycle tubes, about 36,000 automobile tyres and 25,000 automobile tubes per annum.

Madras Industrial Linings Ltd: Located at the Ambattur Industrial Estate, Madras Industrial Linings Limited (MILL) is equipped with the latest facilities to undertake the complete range of rubber and other elastomer linings (annual production capacity 20,000 sq metres) for all types of standard and highly specialised equipment. Technical collaborators of MILL are Societé Chimique de Gerland of France, a leading chemical producer and anti-corrosion lining firm in Europe, with over 50 years' experience in anti-corrosive and anti-abrasive linings and coatings. Under the terms of the collaboration agreement, the French firm has

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nade available to MILL the complete know-how for the manufacture of rubber linings and coatings, including the cold bond system' of rubber lining of arge tanks and vessels *in situ*, using ulcanised rubber compounds and spe-ial adhesives. A revolutionary tech-ique of rubber-lining, the cold bond ystem has rendered possible the carry-ng out of a first-class lining job at client's te, without the use of steam or ot water. Some of the major cold bond ubber-lining jobs successfully carried ut by MILL so far include: (*a*) four arge phosphoric acid storage tanks for Iadras Fertilizers Limited; (*b*) twenty-hree digesters, two thickeners and other essels for the Illmenite Beneficiation roject of Dhrangadhra Chemical Works imited, Sahupuram; and Concrete inks and vats and mild steel storage inks in the Ossein plant of Protein Pro-ucts of India Limited, Ootacamund. rders now on hand include the rubber-ning of two phosphoric acid tanks of uari Agro Chemicals in Goa and another nk from Madras Fertilizers Ltd.

hemical products industry

Tata Fison Industries Ltd: This fac-ry is located in the industrial estate. has an installed capacity to produce 500 tonnes of dust formulations, 500 nnes of wettable powders, 200 tonnes sprays and emulsions, 10,000 litres of aricides (liquid), 300 tonnes of copper ngicides dust, etc per annum. It is a medium-scale unit employing 150 persons.

Food products industry

Britannia Biscuit Co: This unit is situated in the Padi area adjoining the industrial estate—the same area where the units of the TVS Group are located. It employs 366 men and 71 women workers. Commissioned in 1965-66 the factory has a capacity to produce 1,200 tonnes of biscuits per annum. As a regional factory of the company, it ensures quicker supply of fresh biscuits to the Madras market.

Small-scale industries

Modern small-scale industries, some of them using sophisticated equipment, have come up in the Ambattur area, thanks to the subsidised facilities provided by the industrial estate. A majority of the units mentioned in the Statistical Profile section are small-scale units. A break-up of the small-scale units registered with the Director of Industries is available for the Ambattur area only as of December 31, 1967, though the totals for Chingleput District, Madras District and the whole of Tamil Nadu, as of March 31, 1972 could be more readily had.

Available figures for the Ambattur area, as at the end of 1967, show that 140 small-scale units were working in the area. A broad industry-wise classification of these units is given below:

	No of units
Engineering industries ...	87
Non-engineering industries ...	53
Total ...	140

The total outlay on the 140 small-scale units, as of December 31, 1967 in the Ambattur area, was Rs 4.09 crores, giving an average of about Rs 2.92 lakhs per unit. Again as of that date, the number of workers employed by the 140 units was 5,120, that is, on an average 37 workers per unit. The capital outlay per worker employed was Rs 7,890. It is possible that the average outlay per small-scale unit would have increased during the years 1968-72 because of the generally higher level of prices.

The engineering industries constitute the dominant group in the small-scale sector, as in the medium- and large-scale sectors, in the Ambattur area. Non-engineering industries such as those relating to chemicals, fertilisers, pharmaceuticals, dyestuffs, plastic and polythene products, paints and varnishes, may gain in importance in all the sectors in the future as the secondary effects of the Madras Refinery, the Madras Fertilizers and the existing or proposed petro-chemical industries come into play. This, incidentally, points to the possibilities of further growth of industries in the Ambattur area during the 'seventies. □

Ambattur Industrial Estate and its environs

y A SPECIAL CORRESPONDENT

HE Ambattur Industrial Estate pro-ject was conceived in 1961. Land cquisition for the estate commenced e same year and the first clod of rth was turned in 1962. The first atch of factories commenced produc-on in 1963. By 1965 the entire estate as humming with industrial activity, ith almost a hundred factories in pro-uction. The aggregate Government itlay on the project included Rs 77 khs towards the cost of land, Rs 223 khs for the construction of factory nits and other buildings, and Rs 56 khs towards sewage, water supply, c.

In Phase I of the project, 137 factory nits have been constructed. The built eas of different types of units and the monthly rentals are given in the accompanying table.

A subsidised rent of 13 paise per sq ft is charged for these units at present. The monthly demand towards factory rent is Rs 1.38 lakhs.

About 1,200 acres of land in Phase I and II have been developed. The

Built areas of industrial units (Area in sq ft)

Type	No. of units	Built area of each unit			Unbuilt open space of each unit	Total area of each unit	Rent per month per unit Rs.
		office	factory	amenity building			
A	10	2,728	11,773	1,540	13,119	29,160	1,981
B	20	2,728	9,826	1,540	14,410	28,504	1,736
C	20	2,228	7,879	1,369	12,415	23,891	1,401
D	20	2,225	5,932	1,322	11,632	21,115	1,155
F	17	1,685	4,074	205	7,923	13,887	702
G	18	905	3,042	205	5,765	9,917	485
FA	2	1,040	3,194	3,112	8,709	16,055	881
FB	4	856	2,076	1,680	7,471	12,083	536
FC	6	409	1,197	1,096	3,398	6,160	313
L	20	..	1,053	48	6,099	7,200	..

developed plots range in size from ½ acre to 25 acres, and are provided with facilities such as water supply, power supply, drainage, sewage and roads. The cost of the plot is Rs 20,000 per acre. Of the 124 plots available in Phase I, 110 have been allotted. In Phase II, of the 173 plots available, 80 have been allotted.

Ninety-nine double-room tenements and 54 single-room tenements have been constructed for the benefit of the workers in this Estate. The monthly rents are Rs 26.50 for a double-room tenement and Rs 24 for a single-room tenement.

Unlike the conventional type of industrial estate which entertains only small-scale industries, the Ambattur Industrial Estate is designed to accommodate small, medium and large industries. It provides not only ready-built factory units for small industrialists but also developed plots on which entrepreneurs can put up their own buildings for small, medium or large industries.

The estate lies in an important industrial belt where a number of large industries such as the Integral Coach Factory, Central Heavy Vehicles (Tanks) Factory, T. I. Cycles, T. V. S. Group, Dunlop and Omega Cables, are located. It is situated in the Saidapet taluk of Chingleput district, three miles from the municipal limits of Madras City. The estate spreads on either side of the Madras-Avadi Road, and the Madras-Arokonam broad gauge railway line (on the routes to Bombay, Bangalore and the West Coast) is its northern boundary.

Space is being provided for t location of chemical and fruit-bas industries with amenities like stea cold storage and tin-can making un The factory units are so designed wi plenty of open space as to facilita future expansion. For instance, a type unit can be expanded to an 'A' ty one by adding two more bays and a type unit to 'C' type by a similar pr cedure. Only subsidised rent is charg for the units in the initial stages. T cost of developed plots is recovered instalments.

The estate is also provided wi labour tenements, transport faciliti power and water supply, petrol bun industrial training facilities, bankin services, residential accommodation a departmental common service centres.

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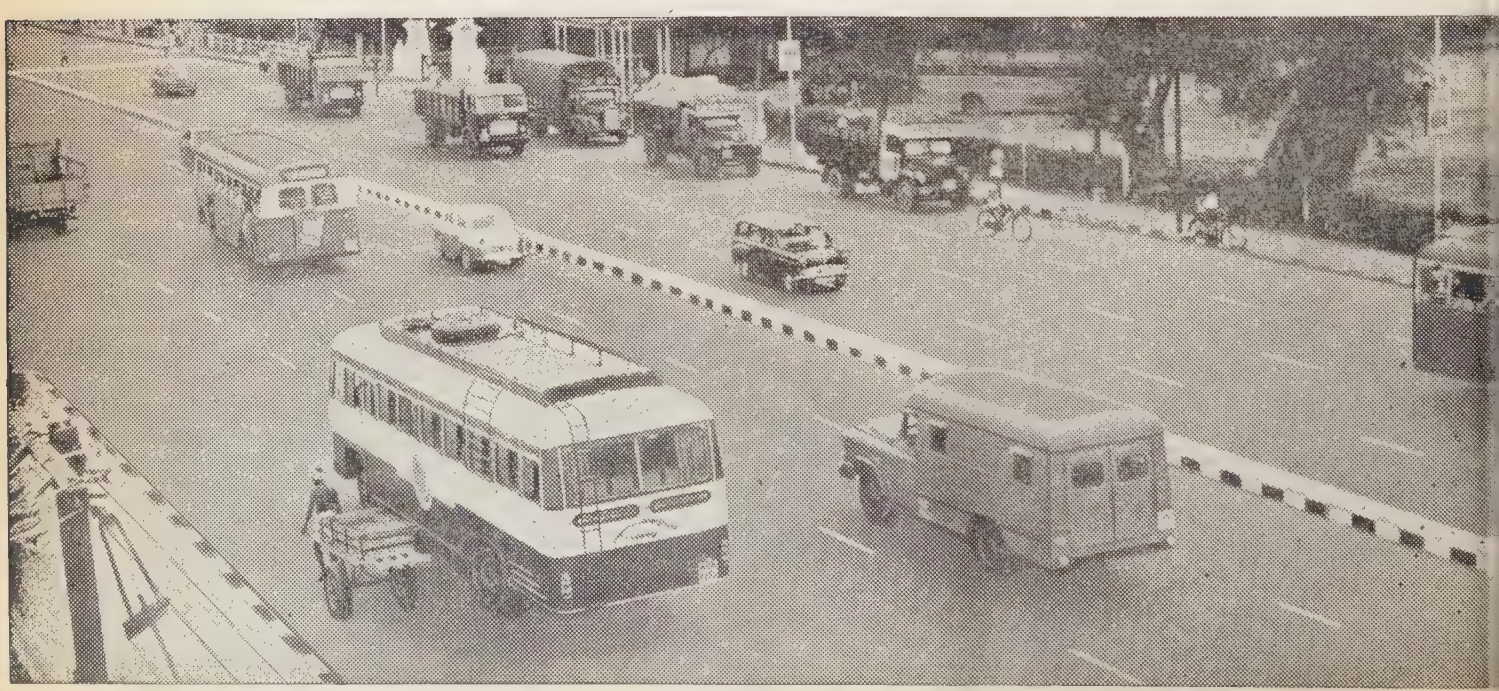

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A model industrial estate

By K. S. KRISHNASWAMY

INDUSTRIAL estates which have been promoted under the Plans are meant to encourage growth of small industries, to attract small-scale industries from congested areas to estate premises so as to increase productivity, to achieve decentralised development of industry in small towns and villages and to foster growth of ancillary industries in townships surrounding major industrial undertakings. The Ambattur Industrial Estate—a model to emulate—is a major venture in this direction. It is a unique example of how the State can, by careful preliminary planning and effort, reduce considerably the time-lag between the conceiving of an industrial unit and its actual establishment. The estate, situated on the Madras-Avadi road and occupying about 1,200 acres of land, is the biggest of its kind in Tamil Nadu and perhaps in the whole of India.

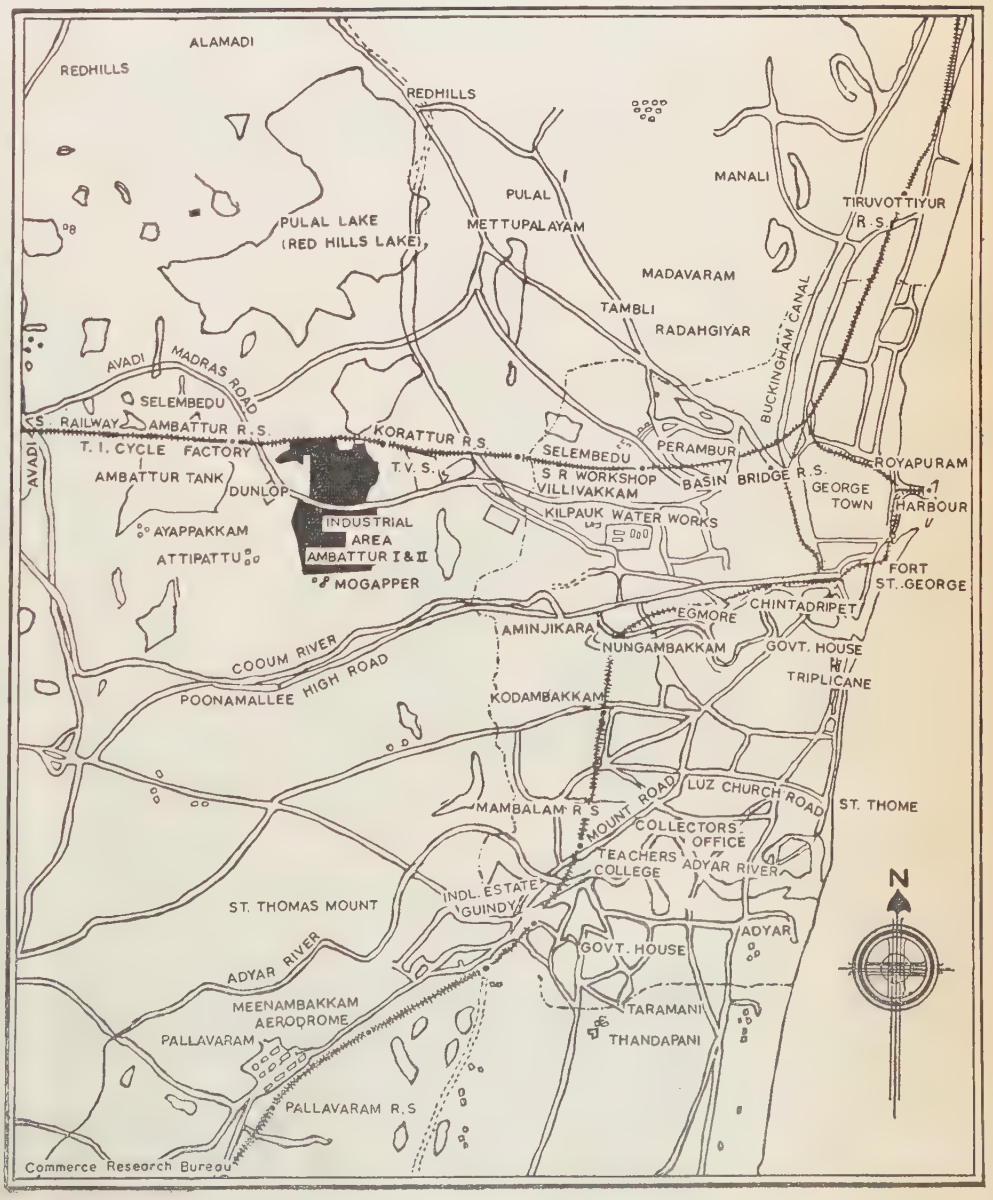
The Ambattur estate is maintained by the Department of Industries of the Government of Tamil Nadu. The first phase of establishing industries—in rented factory units or on developed plots—is nearing completion in the southern portion of the estate covering an area of 630 acres. The second phase of establishing industries in the northern portion covering an area of 570 acres is now in full swing. The estate may be broadly classified into (a) area occupied by the ready-built units of varying sizes wherein space for factory is provided by the Department of Industries and Commerce on a rental basis at the rate of 3 paise per sq ft per month and facilities like water supply, roads, sewage and lights are made available on charges to be levied, (b) developed plots in the (southern and northern sides) where land alone is allotted at the rate of Rs 20,000 per acre and the entrepreneurs are required to construct factory buildings, where also the same amenities are offered. There is a move afoot, as elsewhere, to give away the rented units on deferred payments and, in both cases, it would result ultimately in self-contained ownership.

For the benefit of artisans, who have emerged as a new class of entrepreneurs, ready-built factory units are made available on a nominal rent of about Rs 100 per month. The estate is well served by modern tool rooms which caters for the requirement of industries in the estate as well as outside in tools, dies, jigs and fixtures. There are structural and fabrication workshops which handle a variety of engineering jobs. A telephone exchange, a post and telegraphs office, a fire station, a police station and a petrol bunk have been provided. The State Bank of India and the Indian Overseas Bank and a branch of the Life Insurance Corporation are also functioning.

There are a good number of tenements constructed in the eastern part of the estate for the benefit of industrial employees. A canteen and a technical information library are some of the other facilities. A dispensary of

Mr Krishnaswamy is President of the Ambattur Industrial Estate Manufacturers' Association.

AMBATTUR INDUSTRIAL AREA
LOCATION MAP



the Employees' State Insurance Corporation is situated in the neighbourhood of the estate. The nearest railway station is Korattur, about a mile north of the estate.

While government control over the estate is exercised by the Administrative Officer appointed by the Industries Department, the industrialists of the estate have their own organisation—the Ambattur Industrial Estate Manufacturers' Association—to look after their interests relating to (i) rent, maintenance of amenities, security, etc within the estate, and (ii) procurement of raw materials, taxation (municipal, State and Central), import and export. Each such association of industrial estate manufacturers in the State is linked to the Tamil Nadu State Industrial Estates' Association which also seeks liaison with the authorities for easing out their common problems. The Federation of Association of Small Industries of India, which is a central all India organisation for small industries in general, has its regional organisation in Madras and all these bodies are affiliated to it for tackling their problems at the all-India level.

The Ambattur Association is making arrangements for setting up a permanent exhibition of products manufactured by industrial units in the estate. Space has been provided by the Department of Industries and Com

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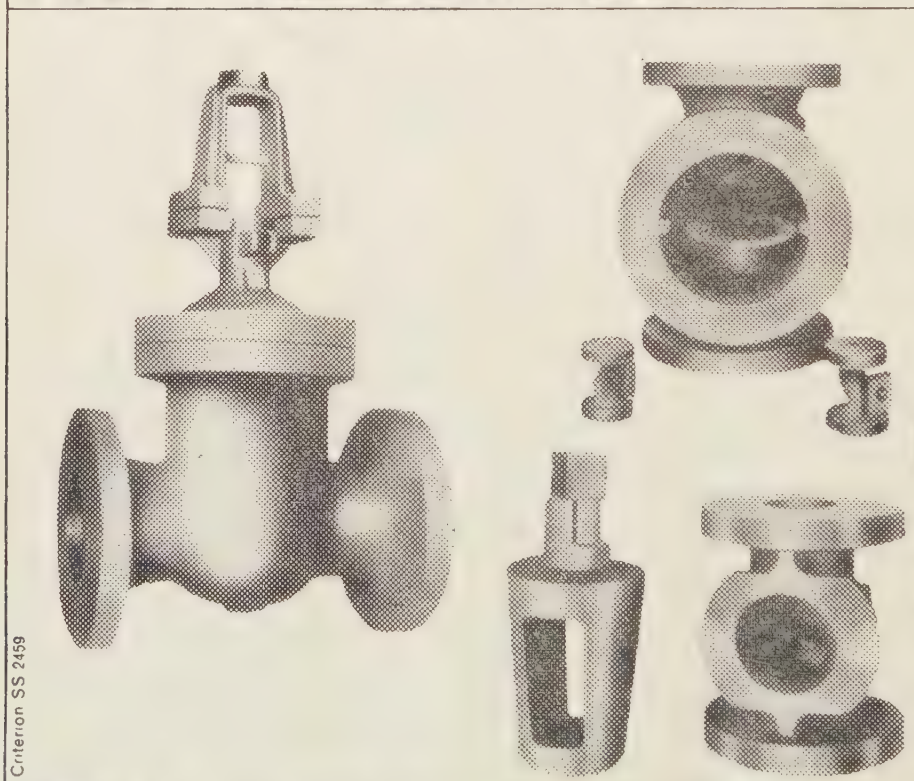

Criterion SS 2459

Sivanandha Steels

— *Casting the Nation's aspirations*

rce for this purpose. In addition, the sociation is taking steps for bringing a directory of its members in the ar future. It has also a proposal to titute an award for the best export rformance by any member during a ar.

The range of production in the nbattur Industrial Estate covers chine tools, engineering accessories d equipment, tractors and agricultural plements, P.V.C. pipes and tubes, bles, packaging materials, footwear, mestic appliances, weld mesh, brake d clutch linings, garments, fans and variety of electrical and mechanical pliances, extrusions, ferrous and non-rous castings, die and tool making, cision instruments, sophisticated ctronic equipment and food products. Further, several ancillary items which are required by automobile industries and the railways are manufactured in the Estate.

The Ambattur Estate has brought into existence factories of various sizes with investments ranging from Rs 3 lakhs to Rs 3 crores per unit. The total capital investment in the area, estimated on the basis of figures furnished to the Ambattur Industrial Estate Manufacturers' Association by its members, is of the order of Rs 20 crores and this investment has generated employment for about 10,000 people. The aggregate annual turnover of all the units in the estate is about Rs 30 crores to Rs 35 crores and the wages disbursed to employees is of the order of Rs 2.5 crores to Rs 3 crores a year. After the first-phase industries are fully developed and the second phase is completed, as many as 30,000 workers are expected to be employed by all the units in the estate.

To sum up, the Ambattur Industrial Estate is a judicious admixture or a harmonious blending of large, medium and small industries. Besides generating additional employment, it acts as an instrument attracting new entrepreneurs. The estate provides vast scope for the formation of new capital and enables small businessmen with low capital to enter the field of manufacturing. Situated right in the heart of a growing industrial belt, the Ambattur Estate bears testimony to the skill and enterprise of entrepreneurs, technocrats and labour alike. □

PVC pipes in the service of agriculture

T. VIJAYARAGHAVAN

HE use of rigid PVC pipes for potable rural water supply, borewell appli-tion, sprinkler irrigation and pumpset nnections is catching up in our coun-y. However, we still have to go a long ay compared to advanced countries ch as Japan, Germany and the Nether-nds in the use of PVC pipes for ese applications. The total yearly nsumption of rigid PVC pipes in dia now is about 2,000 tonnes against 5 lakh tonnes in Germany, 1.6 lakh nnes in Japan and 60,000 tonnes in olland.

Conservatism and the tendency to ke the line of least resistance by stick-g to old methods are some of the rea-ns for PVC pipe applications not veloping fast enough. Another aspect the cost of raw material—the PVC re-n. Compared to the international mar-t, the cost of resin in India is nearly 0 per cent. At present there are only ur major plants in India, manufactur-g about 40,000 tonnes per annum. hen the writer was in Europe recently, formation was gathered at Rotterdam at the PVC resin plant of 50,000 ton-s per annum capacity in one of the finery complexes was being consider-uneconomical and they were, there-re going in for a 1.5 lakh tonnes unit, completely scrapping the existing unit. In India, however, the biggest plant we have is only of 20,000 tonnes capacity.

Also, it is understood that the most economical resin plants are naphtha-based. But in our country other raw materials are used in some plants, which, apart from being in short supply from time to time, put up the cost of the resin manufactured. Right now there is scarcity of PVC resin in the country, due to which the prices are tending to go up. However, other manufacturing units are coming up in the field which may ultimately bring down the cost of resin over a period of time. If this happens, the cost of PVC pipes will become much more economical and this will result in more widespread use of rigid PVC pipes for the applications already mentioned.

Only 3.5 per cent of the rural population has so far been provided with safe piped water supply in our country. During the 20-year period from 1950 to 1970 only Rs 150 crores were spent on rural water supply schemes. It is estimated that nearly Rs 750 crores would be required to provide safe drinking water for the entire rural population. The Fourth Five-Year Plan has provided Rs 150 crores for rural water supply schemes. Nearly 40 to 50 per cent in any water supply scheme goes towards the cost of pipes. From this one can realise the necessity of effecting economy, consistent with quality, in the purchase of pipes for the various water supply schemes. This is where rigid PVC pipes come into the picture.

Tables 1 and 2 give the cost of PVC pipes compared to G.I. up to 90 mm and CI and AC over 90 mm, taking into account the installation cost.

From the amount that is made available for rural water supply schemes more villages can be provided with safe drinking water with the use of rigid PVC pipes. The States of Tamil Nadu, Uttar Pradesh, Rajasthan and Haryana have already entered into rate contracts with PVC pipe manufacturers

Table 1 : PVC and GI pipe prices

Size in MM	Price of PVC pipe per metre (Rs)	Price of GI pipe per metre (Rs)	Percentage saving
20	2.10	3.59	41
25	2.65	4.75	44
32	3.95	6.37	38
40	5.70	7.92	28
50	7.00	9.89	29
63	7.90	12.57	37
75	9.90	17.30	43
90	10.75	20.50	47

Mr Vijayaraghavan is Marketing anager of Wavin India Ltd, Ambattur dustrial Estate.

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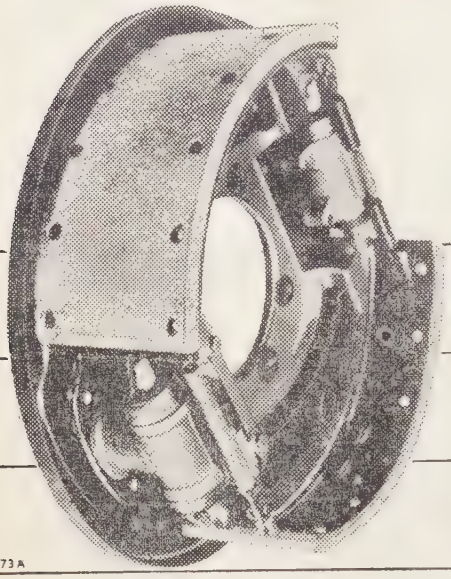

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n view of the economy. In Tamil Nadu nore than 600 villages use PVC pipes or water supply. Uttar Pradesh has ought in the last few months nearly s 40 lakhs worth of PVC pipes mostly or rural water supply schemes. Rigid VC pipes are suitable for the hilly and nountainous regions of Nagaland, ssam, West Bengal, Uttar Pradesh, limachal Pradesh, Jammu and Kashmir n view of their light weight and the ase with which they can be transported vithout any breakages. PVC pipe is lso ideal for installation in saline soils ncountered in Rajasthan and Gujarat nd the coastal belts of West Bengal, rissa, Tamil Nadu and Kerala in view f their resistance to corrosion.

Recently a sample from the first-ver PVC line for water supply laid in ndia at Chattarpur in the outskirts of Delhi in 1962 was cut out and taken and t was found that there was absolutely o deterioration in the quality of the ipe. The bore was also smooth without ny incrustration, whereas in conven-ional pipes like CI, apart from being orroded, there is usually considerable mount of incrustration reducing the low as the inner surface is not as mooth as that of PVC pipe. Also, as VC pipes are non-conductors of electri-ity, there is no deposition due to elec-rolytic action as in the case of metal pipes due to earth fault current. Above all, while the prices of conventional pipes such as AC, GI and CI are going up year after year, the price of PVC pipe is steadily going down.

In view of the fact that rigid PVC pipe is a new product in this country, and our inherent tendency is to over-design with a higher factor of safety,

Table 2 : Installation costs

Size in MM	Total installed cost/metre		
	PVC (Rs)	AC (Rs)	CI (Rs)
90	12.00	16.00	24.50
110	13.50	20.00	30.50
140	19.50	24.50	37.00
160	24.00	30.00	45.75
200	39.50	45.50	65.50

PVC 4 kg. Working pressure = AC–Class II = CI–IA

the wall thickness as per our standards is on the high side, even after making allowance for higher ambient temperature compared to pipes manufactured in developed countries. The wall thickness therefore is bound to be brought down with experience and PVC pipes may become still cheaper.

Table 3 shows how far PVC pipes have replaced even a comparatively recent product like AC pipes in Denmark and Sweden over the past eight years. The same pattern may emerge in our country.

For thousands of years flood irrigation has been practised in our country. This requires large quantities of water, much of which goes waste and also reduces soil fertility. Maintenance of field channels involves additional expense and reduces the effective area for cultivation. Sprinkler irrigation with rigid PVC pipes is the most modern method of controlled overhead irrigation. This method is very much in vogue in advanced countries such as Holland and is being introduced in India gradually. In this system, water is pumped under pressure through portable water pipes fitted with quick couplers. Through these pipes are connected at intervals sprinkler laterals, from which water is forced through revolving sprinkler heads to fall as fine spray. Being light-weight and easy to handle, the whole system can be removed from one area to another till the entire field is covered. This method requires only half of the water

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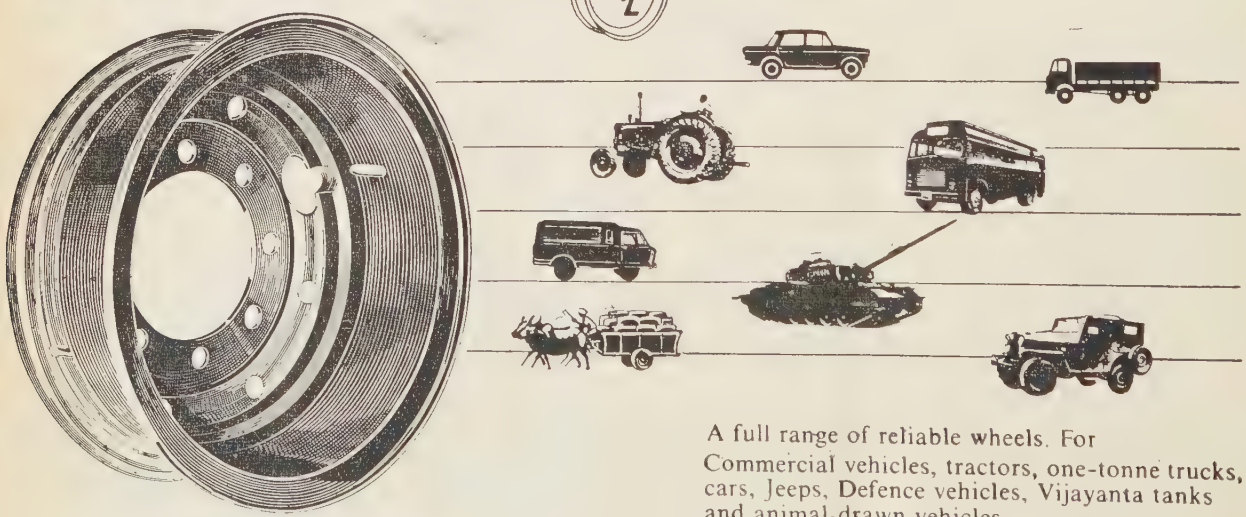

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quired for the conventional type of rigation, and helps avoid over or nder-irrigation only the right quantity water is utilised and the soil structre is maintained. Excess water leaches il depriving it of valuable minerals. rface irrigation also permits the soil breathe easily enabling easy aeraon. Another advantage is that uneven nd can be irrigated without incurring y expenditure on account of levelling. is also possible to dope soluble fertiser to the irrigation water.

The sprinkler irrigation system inolves purchase of pumpset; but the tra cost is more than offset by the ecomy in cost of levelling, channel conruction, economy in water and other aintenance expenses involved in flood rigation. In large farms tractors can e operated between fields without havg to cross water channels. At present rinkler irrigation systems using alumium pipes are marketed widely in our untry, and the total sales now amount Rs 2 crores per year. PVC pipes are so being used gradually in view of the any inherent advantages compared to etal pipes such as non-corrosiveness, sy installation, ease with which they n be repaired on the spot, and cheaper st. The necessary sophisticated injecon moulded fittings specially designed for this system are also now manufactured in our country.

In a vast country like ours, the necessity for tapping underground water for drinking and irrigation purposes cannot be over-emphasised, and at various governmental levels units have been set up for exploiting this source. Large amounts are being spent by the various State Governments and the Centre for this purpose. Here again PVC pipes can play a very imprtant role in reducing the cost. PVC pipes have been used for tubewell application for depths up to 600 feet in India. Compared to conventional metal pipes, the cost is around 65 per cent.

Rigid PVC pipes have been used for tubewell application by the Central Ground Water Board, the Ground Water Division of the PWD (Tamil Nadu), etc. The Tamil Nadu Agricultural Department has used PVC pipes extensively in the Minjur area of Ponneri Taluk and farmers have standardised on PVC pipes. The Directorate of Tubewells in Madhya Pradesh has conducted elaborate tests on the use of rigid PVC pipes on borewell application and reports received so far indicate that the tests have been successful.

Farmers are finding it more economical to use PVC pipes for suction as well as delivery lines. In many parts of Tamil Nadu during summer the water table goes down and the wells become dry. The farmer takes the pumpset to the bottom of his well and pumps water from a borewell. In such cases dismantling of pumpsets with GI pipes involves additional cost and time. Rigid PVC pipes answer all these problems. They minimise dependence on skilled plumbers in rural areas and enable a comparatively unskilled farmer to make perfect joints and repairs inexpensively and quickly. □

Table 3 : Utilisation of PVC and AC pipes in Denmark and Sweden

Year	Denmark		Sweden	
	PVC	AC	PVC	AC
1962	625	13,889	1,983	6,434
1963	3,313	11,687	2,448	7,217
1964	3,936	12,044	4,091	7,091
1965	4,842	11,158	6.410	8,516
1966	6,580	9,420	10,350	4,995
1967	8,740	8,260	10,680	4,700
1968	9,927	7,601	11,570	4,300
1969	12,721	8,691	12,180	3,900
1970	12,904	6,295		

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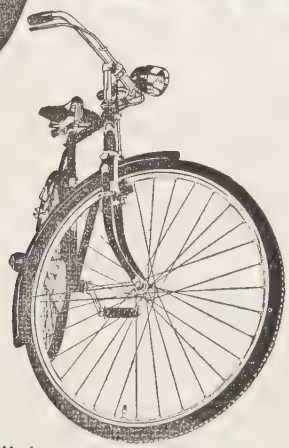

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Ambattur: A statistical profile

Employment in factories worked by power (1970)

Madras Postal Circle No.	Name of factory	Average number of workers employed daily		
		men	women	total
	Food except beverage			
53	Bharat Flour Mills	25	—	25
53	T. Pachiappa Nadar	7	—	7
50	Britannia Biscuit Co	366	71	437
50	Padi Egberts India Ltd	11	2	13
53	Ambattur Peanut Products (P) Ltd	18	—	18
	Footwear, other wearing apparel and made-up textile goods			
58	Ambattur Universal Footwear	17	13	30
58	Onward Trading	23	—	23
58	Coromandel Garments	33	195	228
58	Ambattur Clothing	24	169	193
	Paper and Paper Products			
58	R. K. Paper Industries	19	3	22
58	Siva Packaging Industries	33	—	33
58	Scientific Packaging Industries	5	5	10
	Printing and publishing			
58	Vacha Fine Arts	47	1	48
	Rubber and rubber products			
53	Dunlop India	1,546	2	1,548
58	General Rubber Latex	48	—	48
58	Automobile Rubber Products	23	—	23
58	Madras Industrial Linings	75	—	75
58	Air Foam Industries	11	—	11
	Chemical and chemical products			
58	Tata Fishon Industries	131	21	152
53	Ultramarine and Pigments	129	1	130
58	Mehta Paints	6	—	6
58	Kapadia Paints	17	—	17
58	Winstone India (P) Ltd	15	—	15
58	JBA Printing INK	18	—	18
58	The Calcutta Chemical	20	—	20
	Non-metallic mineral products (except products of petroleum and coal)			
53	Deccan Safety Glass	23	—	23
	Basic metal industries			
53	Madras Wire Products	55	—	55
58	India Forge and Drop Stamping Ltd	820	—	820
58	Indian Bright Steel Co Ltd	81	2	83
58	National Engineering Co	65	—	65
58	Industrial Feeders	40	—	40
58	Sivananda Steels	359	—	359
58	S. K. V. Industries	36	—	36
58	Metal Cast Services	213	—	213
58	Pressmac Industries	16	—	16
	Metal products (except machinery and transport equipment)			
58	Madras Metal Can Manufacturers	17	7	24
53	Bharath Metals Corporation	17	—	17
53	Madras Can Factory	14	—	14
58	Standard Metal Pressing	23	—	23
58	Paramount Industries	(not received)		
58	J. Stead & Co	88	—	88
53	Modern Industries	15	—	15
58	Sri Lakshmi Industries	15	—	15
58	Sundaram Fastners	185	—	185
58	Southern Electricals (P) Ltd	35	—	35
58	Evans Industries	14	—	14
58	Metro Engineering	51	1	52
58	Madras Metal Pressing	18	—	18
58	Sarada Industries	64	1	65
58	Engineering Tools and Services	49	2	51
58	Madras Metagraph	40	9	49
58	Standard Machine Tools	47	—	47
58	General Engineering Industries	68	1	69
58	India Filters Manufacturers (P) Ltd.	53	—	53
58	N. S. Krishna Rao Body	23	—	23
58	Associated Engineering	83	3	86
58	Comsales Industries	37	2	39
58	Eskeyar Engineering	30	—	30
58	Swiss Welded	39	—	39
53	Bharath Metal Rolling	12	—	12
	Machinery (except electrical machinery)			
58	Kunal Engineering	121	—	121
58	Government Tool Room Shop (State)	35	1	36
58	Kerry Jost Tools	38	—	38
58	Kwality Industries	74	—	74
58	Bitual (P) Ltd	16	—	16
58	Productivity Elements	41	—	41
58	Armcess Gauge	73	—	73
58	Gordon Woordroffe Engineering Ltd	57	—	57
58	Machines Mandrels	29	—	29
58	Es-Tee Engineering	20	—	20
58	Hargo Industries (Machine Tools)	26	—	26
58	Transistor Products (P) Ltd	40	4	44

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Ambattur: A statistical profile

Employment in factories worked by power (1970)—*contd.*

Madras Postal Circle No.	Name of factory	Average number of workers employed daily		
		men	women	total
	Machinery (except electrical machinery)—contd.			
58	Madras Spindle Co	35	—	35
58	Engineering Service Corporation	80	—	80
58	Common Lease Shop (State)	15	—	15
58	Government Structural Workshop (State)	230	—	230
53	Coromandel Steels Ltd	184	2	186
53	Madras Radiators and Pressings	110	—	110
58	Chemech Engineers (P) Ltd	84	—	84
58	Marine Ancillaries (P) Ltd	16	—	16
58	Indo-Europe Trading Co (P) Ltd	14	—	14
58	Sri Kamakshi Industries	36	—	36
50	Marshall and Sons	142	2	144
58	Arkey National Engineering	21	1	22
58	Engineering Accessories (P) Ltd	20	—	20
58	Machine Tools Accessories (P) Ltd	9	—	9
58	Engineering Investment (P) Ltd	30	—	30
50	Venkatesh Enterprises	5	2	7
58	Instruments & Apparatus (P) Ltd	6	1	7
58	The Standard Workshop	(Not received)		
	Electrical machinery, apparatus, appliances and supplies			
58	Shibha Instruments	42	—	42
58	Best and Co	66	—	66
58	Southern Switchgear Ltd	356	7	363
58	Kel Components	64	45	109
58	The Emega Insulated Cables C(I) Ltd	145	—	145
58	Vinyl Cable Industries	44	9	53
58	Kemcos Chemical Industries	23	1	24
53	T.I. Miller Ltd	162	—	162
58	National Electricals	120	—	120
58	Modi Electrical Manufacturing	58	—	58
58	Alvitta Electricals (P) Ltd	39	—	39
58	Nu-wood Pvt Ltd	39	1	40
50	K. G. Rohini Industries	14	—	14
58	India Meters Ltd	432	117	549
	Transport equipment			
58	Madras State Transport Depot, Ambattur Depot (State)	(Not received)		
53	T. I. Cycles of India	1,900	2	1,902
58	Es-Tee Hubs and Drives	18	—	18
50	Wheels India Ltd	537	—	537
53	Wright Saddles of India	41	—	41
53	T. I. Diamond Chain	325	—	325
50	The Lucas T.V.S. Ltd	1,657	123	1,780
50	Sundaram Clayton	754	—	754
58	The Dovel Pistons Ltd	23	—	23
50	Brakes India	892	44	936
58	Sarvodaya Industries	19	—	19
58	Automac Madras (P) Ltd	167	—	167
58	National Engineering Co (Madras) (P) Ltd	28	—	28
58	Saral Industries	24	—	24
58	Rane Brake Linings	126	—	126
58	National Industries	4	2	6
58	Autolec Industries	65	3	68
58	Karkit Pvt Ltd	57	—	57
	Miscellaneous industries			
58	Toshinwal Instruments	56	2	58
58	Hydrogen (P) Ltd	31	—	31
58	Tovac Equipments	49	2	51
58	Plastometal	33	1	34
58	National Plastic Industries	20	—	20
58	Autotrol Corporation	30	—	30
50	Lakshmi Pattern Works	18	—	18
58	Lloyd Bitumen Products (P) Ltd	50	—	50
58	Wavin India Ltd	131	—	131
58	Lantics Machine (P) Ltd	16	—	16
58	Rockweld Electrodes India Ltd	38	8	46
58	Polythene Film Industries (P) Ltd	23	5	28
58	Wig India (State)	171	467	638
	Electricity, gas and steam			
50	Korattur Sub-station (State)	35	4	39
50	Asiatic Oxygen	68	2	70
58	Indian Oxygen	71	—	71
	Total	16,100	1,369	17,469

SOURCE: Office of the Inspetcor of Factories, Madras I Circle.

N.B.: (i) The Postal Circle Number '53' to be read as Madras-53 (Ambattur); '58' as Madras-58 (Ambattur Industrial Estate); and '50' as Madras-50 (Padi).

(ii) All factories except the ones marked 'State' are in the private sector.

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Ambattur: A statistical profile

Large-scale industrial undertakings as of 1969

Name of undertaking	Year of licensing or establishment	Products manufactured
I. Cycles of India ..	1949-50	Bicycles and bicycles components.
unlop Rubber	1956-57	Cycle tyres and tubes; automobile tyres and tubes.
heels India	1959-60	Wheels for commercial vehicles, cars, jeeps and tractors.
he Wright Saddles of India.	1959-60	Bicycle saddles.
I. Diamond Chain ..	1959-60	Bicycle and industrial chains.
trac Pharmaceuticals ..	1959-60	Penicillin and streptomycin.
nega Insulated Cables ..	1960-61	PVC and VIR cables, paper insulated power cables, ACSR and AA conductors.
icas T.V.S. Ltd	1960-61	Starter motors, dynamos, horns, head lamps, voltage regulators, etc.
I. Miller Ltd	1960-61	Lamps for autocycles, scooters, etc.; bicycle dynamo lamps.
dia Forge and Drop Stampings.	1961-62	Steel forgings and drop stampings.
ndaram-Clayton Ltd ..	1961-62	Exhausters, compressors, etc. for automotive and non-automotive units.
akes India	1961-62	Complete brake system for automotive and non-automotive units.
India Meters Ltd	1961-62	House service meters.
Southern Switchgear ..	1962-63	Low voltage switchgears, motor starters, iron-clad switches, etc.
Kerry Jost Tools	1962-63	Drilling machines.
Marshall, Sons and Co ..	1962-63	Paver finishers, stone crushers, etc.
Indian Oxygen Ltd ..	1963-64	Welding electrodes.
Wavin India	1963-64	Hard PVC pipes and fitting and PVC compounding.
Tata Fison Industries ..	1964-65	Dust formulations, wettable powders, copper fungicides dust, etc.
The Britannia Biscuit Co. ..	1965-66	Biscuits.
Asiatic Oxygen Ltd. ..	1965-66	Oxygen, dissolved acetylene.
Sivanandha Steels	1965-66	Steel castings.
Madras Industrial Linings..	1967-68	Rubber lining of equipment.
Gordon Woodroffe	N.K.	Collets and feed fingers.
B. T. Shankar Hedge ..	N.K.	Oscillators, frequency dividers etc.
Sundaram Fasteners ..	N.K.	H.T. bolts, nuts and rivets.

SOURCE: *Directory of Large-scale Undertakings in Tamil Nadu* (1969); Department of Industries, Government of Tamil Nadu.
N.K. =Not known.

Ambattur: A statistical profile

Small-scale industrial units registered as on March 31, 1972 (Ambattur units as on December 31, 1967)

Classification of Industry	Chingleput district	Ambattur complex as on Dec. 31, 1967	Madras city	Total for Tamil Nadu
Coal, coke and lignite	1	—	7	15
Iron and steel	634	21	1,377	5,134
Mathematical, surveying and drawing instruments	2	—	3	5
Scientific instruments	10	2	1,400	1,495
Mineral oil	14	—	4	32
Ships and other vessels	—	—	1	3
Sugar industry	3	—	1	38
Telephone, telegraphic equipments	1	1	3	5
Textiles	24	1	177	2,340
Automobiles and ancillaries	85	9	254	892
Tractors, harvesters and spares	3	1	5	22
Cement and gypsum products	87	1	83	720
Electric lamps	6	1	8	26
Electric fans	2	—	2	8
Electric motors	4	—	7	151
Chemicals and fertilisers	166	4	345	1,072
Machinery used in industries including boilers and steam generating equipments	42	7	121	536
Ball, roller and tapered bearings	—	—	1	3
Railway locomotives	—	—	—	1
Railway rolling stock	—	—	3	5
Machine tools	41	16	51	145
Equipment for generation, transmission and distribution of electric energy including transformers	6	1	15	51
Non-ferrous metals and alloys	124	10	319	1,217
Paper and paper products	46	6	185	489
Pharmaceuticals and drugs	21	2	73	195
Fermentation industry	2	—	—	16
Rubber goods	33	5	58	260
Leather, leather goods and pickers	84	—	83	508
Glue and gelatine	1	—	1	17
Vanaspathi	—	—	1	5
Vegetable oils including solvent extracted oil	10	—	18	282
Agricultural implements	56	—	280	931
Batteries, storage for cell	2	—	10	32
Bicycles and parts thereof	11	1	19	104
Hurricane lantern	—	—	2	7
Prime movers	1	—	12	49
Power-driven pumps	2	—	9	153
Radio receivers	11	2	87	210
Sewing machines and their components	1	—	2	7
Knitting machines and their components	—	—	—	1
Small tools	—	—	11	15
Hand tools	1	—	2	15
Glass and ceramics	169	8	69	477
Dyestuff	3	—	3	32
Soap washing toilet	17	—	102	375
Cosmetics and toilets	61	—	421	652
Timber products	3	—	31	102
Ferro manganese	—	—	2	2
Food products	105	4	421	1,848
Matches—fire works	7	—	—	946
Wooden articles and furniture	35	—	138	781
Electrical accessories and equipment	58	13	191	490
Plastic and polythene products and plastic moulded goods	86	11	332	702
Wall clocks, watches and components	1	—	12	20
Paints and varnishes	26	3	77	222
Fountain pen and other writing materials	9	—	38	120
Cine projectors and photographic goods	5	2	36	88
Refrigerators and air-conditioning equipment	4	—	14	20
Printing industry	23	—	463	1,303
Optical goods and lenses	10	1	50	72
Poultry appliances	—	—	3	4
Beverage such as coffee, sacharine	5	—	55	400
Tobacco and tobacco products	1	—	4	98
Grinding wheels and abrasives	2	1	1	12
Typewriting, calculating machines, cyclostyle machines and other office requisites	1	1	7	19
Weighing machines	2	1	2	13
Industrial instruments	3	1	15	24
Gold and silver articles jewellery	—	—	6	58
Musical instruments	—	—	2	4
Stationery articles	—	—	6	30
Mat weaving (power operated)	—	—	1	10
Miscellaneous industries such as beedi industry	21	3	168	662
Total	2,194	140	7,710	26,789

SOURCE: Office of Director of Industries and Commerce, Madras.

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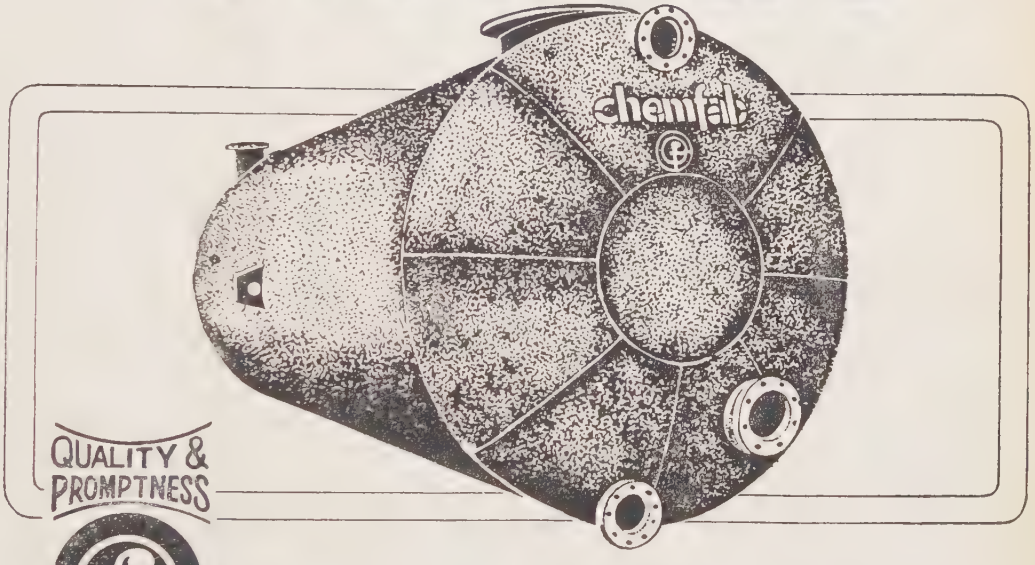

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Paints and varnishes

— A FEATURE

Advances in varnish technology

By G. S. Gill and P. M. Gupte

A VARNISH can be described as a transparent viscous liquid which when applied as a thin coating solidifies into a hard lustrous film and protects the surface without obscuring it. Varnishes can be broadly classified into three categories:

Oil varnishes: These are combinations of resins and drying oils, suitably modified to get desired properties. These dry initially by evaporation of solvent and harden by the chemical changes that take place in the oil on exposure to atmospheric air, thus forming a durable protective coating.

Spirit varnishes: These are solutions of resins in volatile solvents, and dry entirely by evaporation of solvent leaving a thin layer of coating which is hard but soluble in the original solvent.

Water varnishes: These are solutions or emulsions of a resin or glue in an aqueous solution and become more or less insoluble on drying.

Here we shall limit our discussion to the first category only, that is, oil varnishes, starting with its historical background. The use of drying oil dates back thousands of years to the earliest periods of recorded history. No clear information is available as to when it was first discovered, but linseed oil which, when heat treated dried more quickly, was certainly used in the inks in the middle ages. With the increasing demand people started experimenting to improve the drying of linseed oil. It is difficult to say when driers were first used but as early as the second century the accelerating effect of metal oxides on the rate of drying of vegetable oils was recorded by Galen.

By the end of the 18th century and more so in the 19th century, advances were made and speculative additives were eliminated. However, in the 20th century truly spectacular developments took place with the introduction of a spate of specialised products, such as the chemically modified natural resins, oils and synthetic resins. So much so that it has become a problem in itself to make the best choice from the large number of alternatives that modern science and technology have provided.

The main constituents of varnish can be listed as:

(i) *Film former*: These are mainly resins or oils. Resins provide hardness and lustre to the film and drying oils provide elasticity and other protective properties to the film.

(ii) *Solvents*: These help to adjust the consistency for application.

(iii) *Additives*: These are driers, which regulate and accelerate the drying of a film of varnish.

Resins are classified according to their origin, that is, natural and synthetic. Natural resins are used since many years in varnish-making. The important ones still in use include rosin, dammar, shellac and gilsonite. Rosin is the most widely used natural resin which gives highly lustrous films suitable for cheaper varnishes. The drawbacks with the rosin are its high acidity and poor outdoor durability. Satisfactory varnishes are prepared by treating the rosin with lime or esterifying with glycerol or pentaerythritol. Rosin is used in fairly good quantities for modifying the properties of synthetic resins like alkyds.

Synthetic resins as the name implies are resins produced by synthesis of pure substances. The manufacture of varnishes has been greatly influenced by the introduction of many varieties and combinations of synthetic resins. Some important synthetic resins are: Alkyd resins, phenolic resins; maleic resins, amino resins, vinyl resins and acrylic resins.

Alkyd resins: The word *alkyd* was coined by Kienle from the two words *alcohol* and *acid* to include the complexes resulting from the reaction of polyhydric alcohols and carboxylic organic acids, such as the polybasic acids and their anhydrides. This term today covers those resins based on phthalic

The growth of paints and varnishes industry

Year	Paints and varnish		Nitrocellulose lacquers	
	capacity	production	capacity	production
	('000 tonnes)		('000 litres)	
1951	64.8	33.5	..	..
1956	64.8	41.6	..	..
1961	86.4	59.1	3,600	1,776
1966	106.0	67.2	3,360	2,076
1967	106.0	79.5	3,360	1,944
1968	77.5	65.5	2,484	1,872
1969	77.5	62.4	2,484	2,571
1970	NA	66.0	NA	1,973
1971 (*a*)	NA	69.0	NA	1,860
Annual compound rate of growth between 1951 and 1971 (per cent) ..	1.0 (*b*)	3.7	—3.3 (*c*)	2.8 (*d*)

NOTES: NA=Not available.
(*a*) Estimated.
(*b*) Relate to 1951 and 1969.
(*c*) Relate to 1958 and 1969.
(*d*) Relate to 1958 and 1971.

SOURCES: Central Statistical Organisation, Department of Statistics, *Monthly Statistics of the Production of Selected Industries of India, for November and December 1962, Vol. XIV, Nos. 11 and 12, and November and December 1968, Vol. XX, Nos. 11 and 12, and January and February 1969, Vol. XXI, Nos. 1 and 2, and various issues*, Calcutta.

Mr Gill is Technical Executive and Mr Gupte is Research and Development Chemist in Noble Paint and Varnish Co Pvt Ltd, Bombay.

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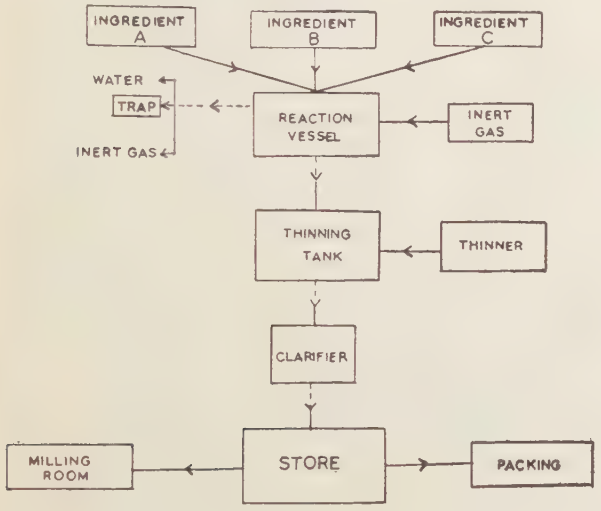
anhydride or some similar acid condensed with poly alcohol and modified with a drying or a non-drying oil.

Phenolic resins: These are extensively used in oleoresinous varnishes. Phenotic resins are classified as follows: (i) modified phenolic—usually rosin is the modifier, (ii) 100 per cent phenolic—oil soluble type, and (iii) baking phenolics.

Phenolic resins are the reaction products of a phenol and an aldehyde with or without modifier. Different

Chart 1



desired properties are obtained by modifying phenolic resin or changing the proportion of ingredients producing phenolic resin.

Amino resins: This is a term used for the class of resins based chiefly on urea-formaldehyde and melamine formaldehyde condensation products. Amino resins are heat convertible type and mostly used in baking coatings. It is fortunate that amino resins are compatible with a wide range of alkyd resins, because the combination produces films with excellent properties. Amino resins combine with non-oxidising alkyds to give coatings of high quality. They are also used with non-oxidising alkyds to reduce the baking time and to improve surface hardness and alkali resistance of films.

Vinyl resins: These are substituted ethylenes and their many copolymers. These include polystyrene, polyvinyl chloride and synthetic rubbers.

Organic liquids are largely used in the manufacture of paints and varnishes as volatile solvents to lower the viscosity, to facilitate the application and to give stability to the resin. After the material is applied to the surface the solvent is no longer required and an essential feature of this type of solvent is complete volatality at ordinary temperatures. The solvents are conveniently divided according to their boiling points—low boiling—below 100°C; medium boiling—from 100°C—150°C; and high boiling—above 150°C.

Driers are special additives which regulate and accelerate the drying of varnish or paint film. Driers are heavy metal soaps of organic acids. At present a variety of organic acids are used and their metal soaps are available as driers. The naphthanates and octoates are the most stable driers commonly used. The driers of interest are the naphthanates and octoates of metals such as cobalt, zinc, lead, manganese, calcium and rareearth.

The operations involved in the manufacture of a varnish, which also is a vehicle for paints is easily illustrated in chart 1.

The unit operations that go into the manufacture of a varnish are:

Material handling (While

PROFILE

Paints and varnishes

THE organised sector in the paints industry consists of 18 units all registered with the Director General of Technical Development. In 1971 the production totalled 67,995 tonnes as against 65,217 tonnes in 1970, and 62,106 tonnes in 1969. The industry whose saleable production is estimated at Rs 70 crores, is steadily recovering from the low production level of the recession period. Its current production is nearly 5,000 tonnes less than the peak reached in 1963. A study of the finances of the major paints units shows that sales have been increasing at the rate of 12 per cent per year for the past two years. The gross profits have also gone up.

The paints industry has been complaining about the shortage of raw materials. Glycerine has been in short supply because, according to the industry, a large amount of the material was not recovered by soap makers in the small-scale sector. The industry has urged the Government to take early action to make arrangements for splitting fat at important centres for recovery of glycerine. The steel balls of required quality are also not available.

Almost all the important raw materials have been canalised through the State Trading Corporation, and the industry says that it has accepted that canalisation has come to stay. But it wonders why the STC should not be able to provide raw materials in time and of required quality. There has been a mark-up on account of the STC's expenses, overheads and profits, and also by way of distributor's commission on the ex-godown sales. Among the raw materials imported by the STC, the shortage of pentaerythritol is acutely felt by the industry. The indigenous sources are not able to provide material of the required quality. The industry has pleaded that the STC should plan import of the item in sufficient quantity. As regards imports of titanium dioxide the position is somewhat comfortable. The industry, however, does not want the Government to take any hasty decision to ban or restrict import of the material because of the proposal of the Travancore Titanium Products to manufacture this item until it was found that adequate supply would be available indigenously.

On the export front, the industry's performance has not been very satisfactory. Included in the list of priority industry, it carries an obligation of a 5 per cent compulsory export. In 1970-71, exports of paints and allied products amounted to Rs 4.81 crores out of which export of paints accounted for Rs 3.30 crores. If, however, exports in open international competition are considered, they amounted to Rs 33 lakhs representing only ten per cent of the total paint export. The f.o.b. value of the exports of the paints industry is less than 2.5 per cent of the value of production of the industry.

Though science-based, the industry has not invested significantly on research. Currently research on 'chlorinated rosin' is being done at the Bombay University's Department of Chemical Technology.

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charging, thinning and for finished product.)
laterial transfer (Into kettle, reaction vessel, thinning tank, clarifier, milling room, finished goods godown.)
olycondensation (process.)
leat transfer.
fixing.
iltration.

he above picture is an alised one since no account taken of such procedures production control and lity control.

lkyd resin constitute the k of the varnishes produc- by any varnish manufac- ing unit.

he common raw materials olved in the alkyd manu- ture can be divided into ee groups:

i) polyhydric alcohol h as ethylene glycol, gly- ol, pentaerithrytol; (ii) ybasic acids/anhydrides h as phthalic anhydride, leic and anhydride; and) oils and fatty acid such linseed oil, safflower oil, tor oil, dehydrated castor and coconut oil.

he manufacture of alkyd ins can be easily under- od by referring to chart 2.

he outstanding property alkyd resins is exterior rability for the entire group resins. The oxidising type ve good adhesion, dry fast d give tough films. Alkyd ins are characterised by ir marked degree of gloss tention and flexibility and e much superior to normal oresinous varnishes in this spect.

Alkyd resins are almost iversally made by a 'batch' ocess. As no high pressures e necessary, large kettles n be safely used for alkyd anufacture. Stainless steel ssels are durable, give pale loured products and can easily cleaned. Hence ey find universal applica- on.

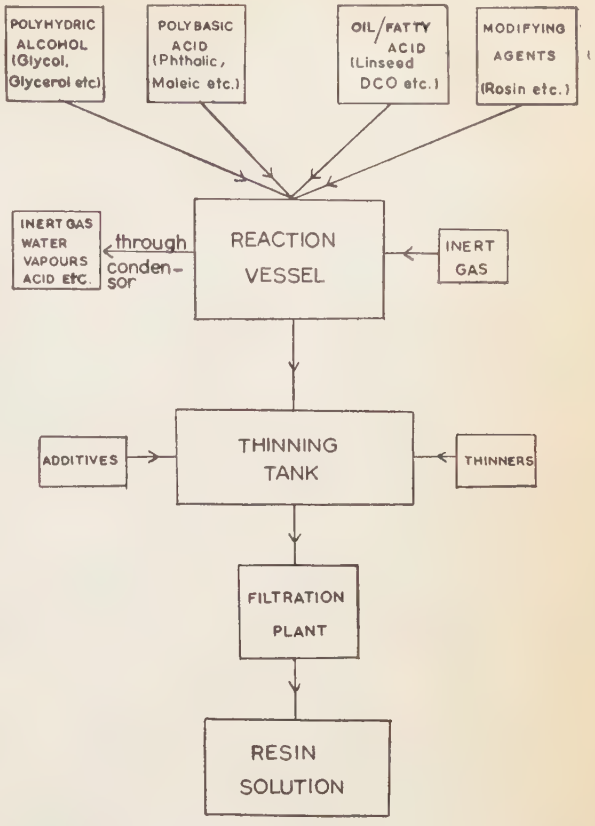
Direct 'fire' or gas heating still continued as the elec- ic heating is very expen- ve, but it is of interest to te that the best heating ethod is the vapour heating ing 'dowtherm'.

Facilities for rapid cooling are necessary. Provision for escape of water formed is usually through a condenser to minimise the loss of glycerine. Provision of adequate agitation is necessary to obtain a uniform product and protect frothing and local charring. The introduction of inert gas is to protect the colour of the resin.

Uptil now we have seen the brighter side of the subject, that is, how varnish manufacturing technique progressed, but on the other side is the difficulty of procurement of raw materials for this industry. These difficulties have definitely hindered the production of varnishes and paints. Raw material shortage has become a perennial problem for the industry. One has to agree with the fact that at a time when our country is developing economically, such problems are bound to be there. The paint and varnish industry was initially confined to bring out limited types of products. But the demands made on the paint industry are now very varied. Other industries have started expecting more and more from the paint and varnish manufacturer for the decoration and protection of their products. This has given an opportunity for the paint technologists to widen their range of products. At present the paint industry in the country, is able to meet the surface coating requirements of a broad spectrum of industries. Naturally with the increase in demand the raw material supply position is becoming more and more acute.

The paint industry is one where raw material constitutes a major portion of price of the end product. The choice of raw material is also responsible for the performance of end product. So apart from the supply position the quality of raw material is also important. It will not be out of place to mention here that most of the raw materials used in the paint and the varnish industry are also used by other industries where they have not to pass similar strict quality control standards. There is every reason to expect adulteration in raw materials when the supply position is so difficult and the prices fluctuating. This is a challenge thrown at the paint technologist. The paint technologist is now a very busy man, and like a fortune teller is often required to look into the future, and with a crystal ball more complicated than that of the fortune teller, his predictions are very near the mark, thanks to the laboratory facilities he controls. □

Chart 2



The growth of paint industry

By A Special Correspondent

PAINT is of utmost importance in the modern industrial development. It provides protection against rust and corrosion and prolongs the life of iron and steel in bridges, ships, and skyscrapers. Consumption of paint and varnish products by industry is thus an index of industrial activity. Paint sales are also an indication of building activity, for a greater part of the paint and varnish products sold through trade channels is used on architectural surfaces.

The paint industry here grew with the chemical and engineering industries in the country. Its beginning as a modern industry dates back to 1890. For the first decade the production, however, was confined to the small-scale sector. It was at the beginning of the century that the first large-scale industrial unit was set up in Calcutta. Before the first world war, the needs of quality paints were met entirely by imports.

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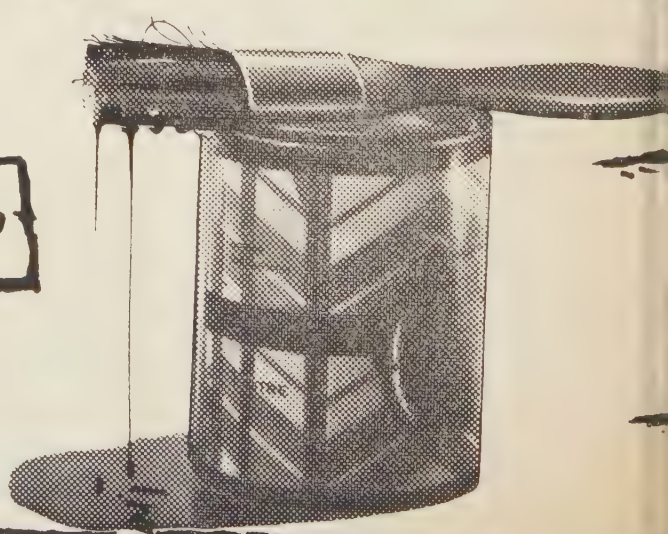

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indigenous industry be- to take roots when for- supplies were cut off and estic demand increased. Second World War pro- d a fillip to the industry the real spurt in growth e during the post-inde- lence era.

the beginning of the Plan the Planning Com- ion had estimated that e were at least 150 fac- s manufacturing paints, ishes and enamels. Two- ls of these units were in small-scale sector. The in- ed capacity of the major s, numbering 50, was then nated at above 65,000 es on the basis of double- working for 300 days annum. In 1951, the out- by important manufac- s was placed at about 0 tonnes. In 1957, the industry was brought in the purview of the In- ies (Development and ulation) Act, and 25 fac- s with a capacity of t 58,000 tonnes per an- were registered. The Plan had fixed a target city of 70,000 tonnes and l production at 60,000 es for paints and var- s. However, the produc- fell far short of the tar- nd was only 39,000 tonnes 1955. In the Second no increase in the capa- was envisaged. The Plan, ver, aimed at an increase he production of paints varnishes which was d at 60,000 tonnes by 61. The actual produc- of paints and varnishes 60 stood at 51,000 tonnes. the Third Plan, the re- ments of surface-coating rial was estimated at akh tonnes by 1966. But development of the in- y, five years after the of the Third Plan, show- hat the production had rossed the level of 70,000 s.

cording to official statis- as at the end of 1971 were 18 units in the ised sector with an in- d capacity of 1.06 lakh s for the manufacture aints, enamels and var- s. The actual production 71 was, however, of the of 66,000 tonnes. The value of the output was esti- mated at Rs 28 crores. Im- port of finished paint items has been restricted and cur- rently only some categories of paint for export production are allowed to be imported.

Apart from the strides taken in the production of paints there has also been a significant progress in the production of essential raw materials for the paints industry. Important among these raw materials are pig- ments, synthetic resins and industrial solvents. A num- ber of inorganic pigments such as titanium dioxide, zinc oxide, white lead, non-setting red lead, yellow chrome, prussian and ultramarine blue are manufactured in large quantities. The country has also achieved a stage of indus- trial self-sufficiency in respect of synthetic resins such as alkydes, phenolics, malerics, melamine and urea formalde- hydes which constitute the base for the production of high industrial finishes. An extensive group of industrial solvents, based on coal tar and petroleum are also avail- able in the country. □

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Ball and roller bearings industry

— A FEATURE

Achievements and goals

y A. K. Roy Chowdhury

HE rolling bearings industry in India has by w reached a stage where it n look to the future with nfidence. The writer remembers the dim days of the st when there was only e pioneer unit engaged in e manufacture of ball bearings in the pink city of ipur. At that time, there ere plenty of critics who ould not consider it possie that mass-produced precin engineered article could manufactured in this coun-. The critics included ny foreigners also.

The most common argunt was based on the fact at during the many decades British rule this country d failed to make progress such engineering industes. The raw material reired for the industry had be imported and the indinous capacity, the critics d, would require many re decades to grow up, if all it did. Some of them en pointed out that conming industries were not a position to fully utilise output of even a single it. In those days it took a at deal of boldness on the t of the Government of lia and some far-sighted dian industrialist who dled to go ahead with the oduction of bearings notthstanding such apparently id arguments. There were many engaged in various industrial activities who automatically assumed that any bearings made in India should be inferior to the imported ones. The writer came across such objections throughout the country in the early days. It was heard frequently that the people manning the machines in this country were not capable of giving correct or sufficient care to make the bearings. Many others were apprehensive that the heat treatment may not be proper. The fact that Indian bearings enjoyed tariff protection and their higher prices owing to various reasons contributed in no small measure in strengthening the opposition to Indian-made bearings. Many were genuine well-wishers of the Indian industry, but many critics also included people connected with the import of bearings in the country.

However, gradually many of the high ball bearings consuming industries such as automobile manufacturers increased their production facilities. The bearings produced in India gradually started being used in increasing quantities. The Planning Commission assessed the requirement of bearings in the country, and as a result several more units were licensed to produce the bearings. Apart from popular sizes of ball bearings, capacities for manufacture of cylindrical roller and taper roller bearings as well as barrel roller bearings and needle roller bearings were licensed. All the units were licensed to produce bearings in technical collaboration with well-known foreign makers.

By this time the protective tariff was withdrawn. Substantial capital outlays were called for and expensive equipment was installed in various units manufacturing bearings all over the country.

Owing to the shortage of foreign exchange many of the bearing-consuming industries had their imported components cut or severely restricted to enable defence and food to enjoy higher priority. Such industries had to seek more and more items required by them inside the country, and in the bearing industry a

Mr Chowdhury is Technical Director of the Antiction Bearings Corporation l, Bombay.

Growth of ball and roller bearings industry

(Lakh numbers)

Year	Capacity	Production	Capacity utilisation (per cent)
1951	6.0	2.3	38.3
1952	6.0	4.2	70.0
1953	6.0	6.5	108.3
1954	6.0	7.0	116.6
1955	6.0	8.1	135.0
1956	6.0	10.4	173.3
1957	6.0	15.8	263.3
1958	6.0	21.3	355.0
1959	9.0	17.0	188.9
1960	9.0	27.0	300.0
1961	9.1	32.2	353.8
1962	32.4	39.1	120.7
1963	57.0	49.5	86.8
1964	89.0	58.8	66.1
1965	115.8	82.5	71.2
1966	115.8	92.4	79.8
1967	121.4	100.7	82.9
1968	127.4	121.9	95.7
1969	172.4	134.1	77.8
1970	158.9	175.0	110.1
1971	189.1	190.0	100.5
Annual compound rate of growth between 1951 and 1971 (per cent)	18.8	24.7	..

SOURCES: 1. For the years 1952 to 1968, Central Statistical Organisation, Department of Statistics, *Monthly Statistics of the Production of Selected Industries of India, for November and December 1962, Vol. XIV, Nos. 11 and 12, November and December 1968, Vol. XX, Nos. 11 and 12, and January and February 1969, Vol. XXI, Nos. 1 and 2*, Calcutta.

2. For the years 1969 to 1971, Ministry of Industrial Development, Government of India, *Annual Report 1970-71 and 1971-72*, New Delhi.

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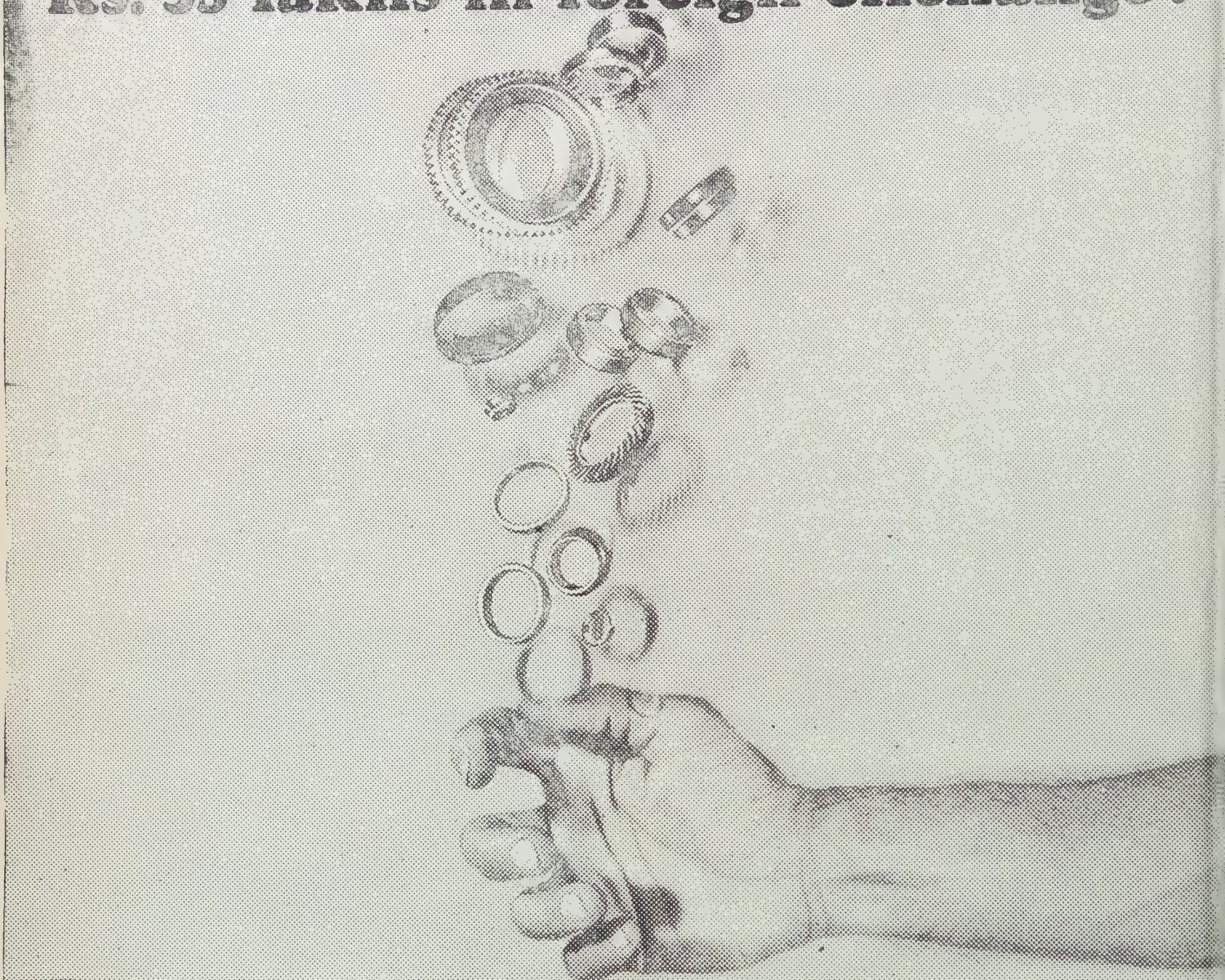

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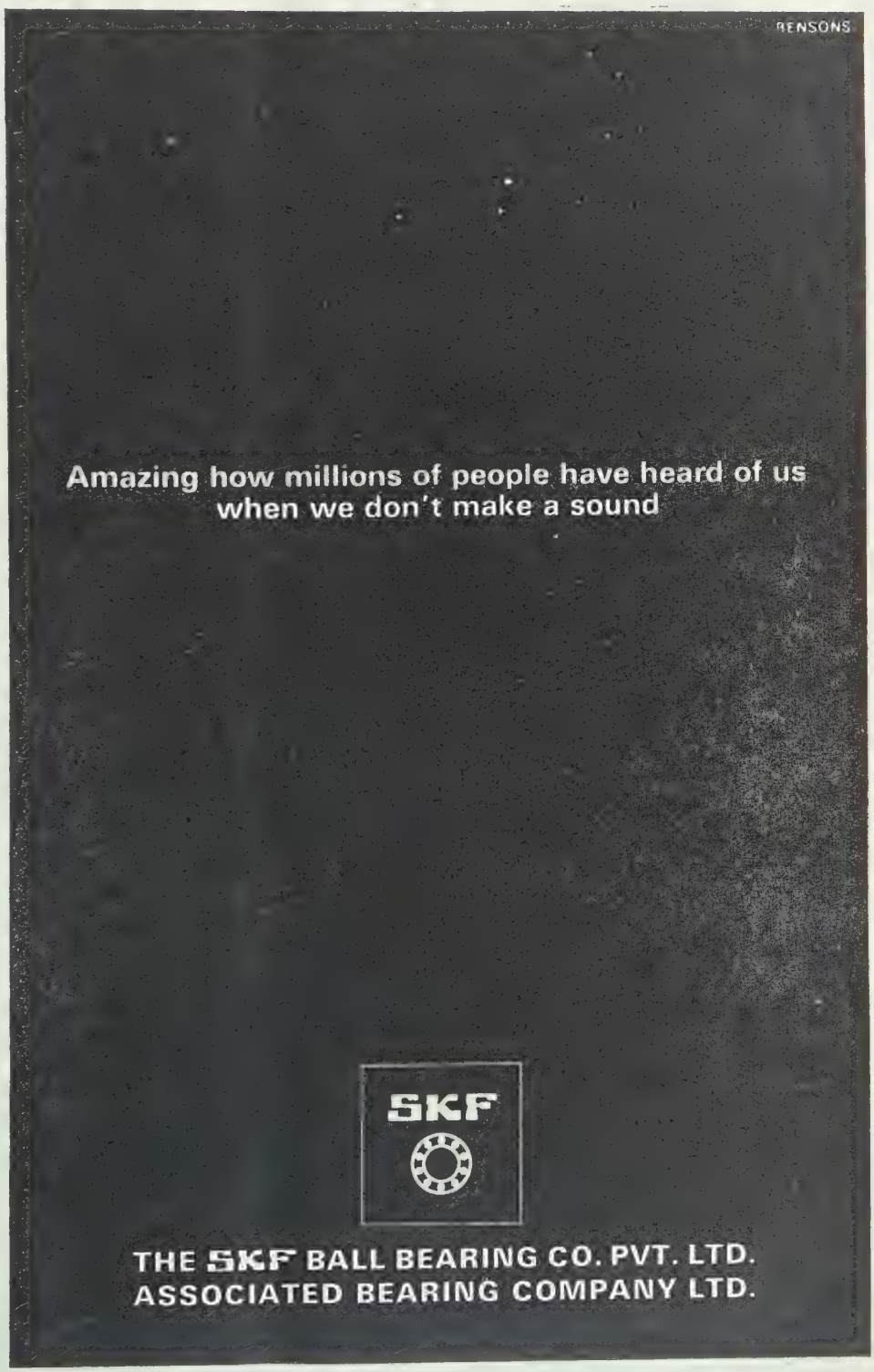
crash programme had to be undertaken for achieving adequate capability to meet the requirement of the consuming industries. The position became particularly critical when it was found that various aid-giving nations started throwing their weight against us. The Indian industries, therefore, had to rise to the occasion and start supplying the requirements of industry and of the defence. Various automobile manufacturers had to depend more and more on the output of the Indian rolling bearing industry for meeting their requirement of bearings. The result of this has been extremely beneficial to the automobile industry which achieved significant success and generated the required confidence on them of the country. Largely as a result of the measures adopted after the 1965 Indo-Pakistani war the shock involved in 1971 Indo-Pakistani conflict was more easily absorbed in spite of the implied threat of involvement of one of the super powers. As a result of meeting the challenge of 1971, the industry has every reason to feel confidence in its own future for not only meeting the requirement of the country but also of sharing foreign markets. From the time Indian industries started manufacturing bearings many innovations were introduced to improve the quality of the product, and to cut down the cost.

Owing to the limitations imposed by the initial restricted plan of output for many units resulting in their being saddled with less economical and sophisticated equipment, no significant development in the manufacture of special purpose machine took place in this country. Therefore, replacement of old and sometimes outdated machines could not be carried out. In spite of all these handicaps the industry by and large has been able to improve the quality of workmanship and keep consuming industries supplied with their requirement.

The writer remembers the days when some of the foreigners employed in some leading Indian industries were giving their opinion rather freely, that the load carrying surfaces of some foreign bearings were superfinished and as such those bearings are better able to carry the load and hence have better performance than those made in this country. This is hardly borne out by experience. However, to accept the challenge the Indian rolling bearing industry rose to the occasion, and today some of the products marketed by the Indian industry are at least equal to the finish of the bearings of foreign manufacturers. As all the units engaged in the manufacture of rolling bearings have a plan for expansion, it is confidently expected that on the completion of this expansion, the output of the Indian industry would compare so favourably with



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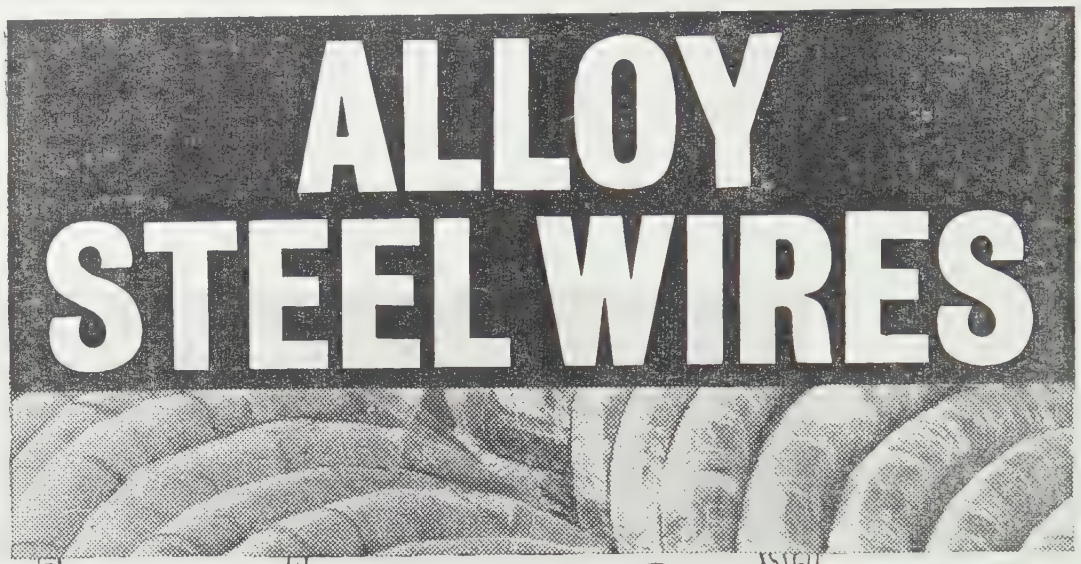

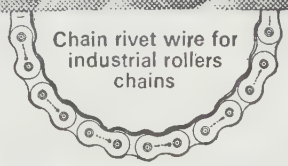

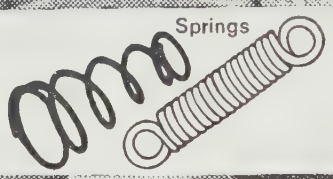

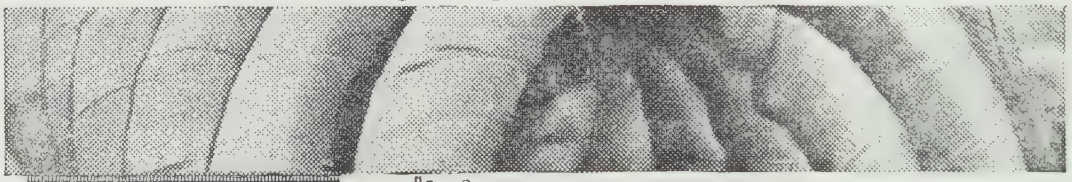

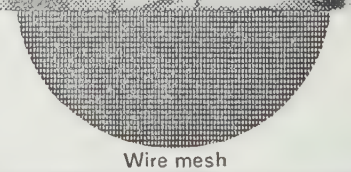

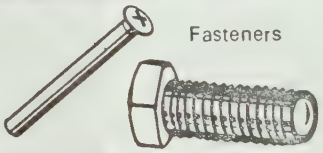

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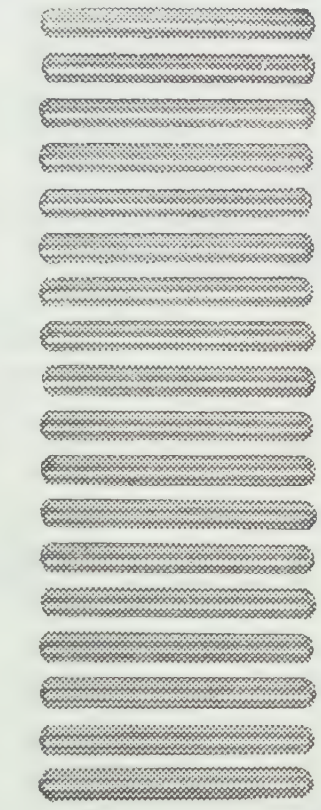
e foreign bearings that it ill not be too difficult to hieve substantial export rformance.

It would seem that indus-ies engaged in the manufac-re of electric fans and elec-ic motors have their com-ete requirements met by e Indian industries. The tomobile industry which is gaged in the manufacture cars and trucks is drawing actically all its require-ents indigenously. There e quite a number of tractor nits which are gradually ing into production and the quirement of their bear-gs also are met from the dian manufacturers to a rge extent.

Although the machine build-g industry is supplied with ite a substantial part of its quirement of bearings, con-rming to normal class of erance, its requirement nforming to precision class e not met by the Indian oducers at the present oment in any significant antity. Most of the require-ents of the machine build-g industry require bearings semi-precision class which designated as tolerance ass 6. The writer believes at in emergency conditions is class of bearings can be pplied by the Indian pro-icers although the cost may ove to be high. If a tionalisation is effected to t down the diversity of zes, then the machine build-g industries can pool their quirements into economic oduction batches for bear-g makers.

Regarding the manufacture higher precision classes ch as classes 5, 4 and 3 very portant applications are volved for bearings belong-g to these tolerance classes. he internal grinding spindles ill be made in future in er-increasing quantities, hich in turn require more arings belonging to toler-nce class 4 and, in some in-ances, to tolerance class 5. arge units for the manufac-re of grinding machines are pected to go into produc-on soon and therefore our dependence on foreign sources of supply for these important bearings have to be eliminated. The manufacture of these bearings in sizable quantities require special facilities. The desired result cannot be achieved by selection from normal batch of production. All these can only apply after it is established that the economic batch for the manufacture of such bearings can be consumed by the machine building industries.

Instrument bearings are required for various instruments belonging to tolerance class 3 in general but the requirement is small. It may not appear to be a good commercial venture to go into production with specialised equipment. These bearings are fitted in vital navigational instruments among other



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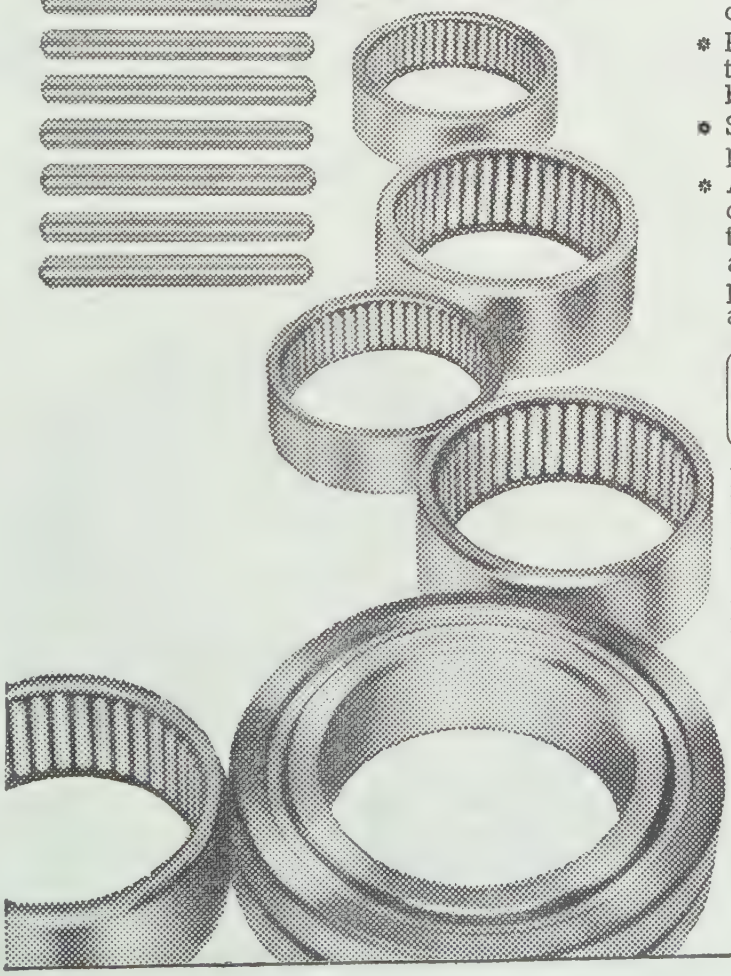

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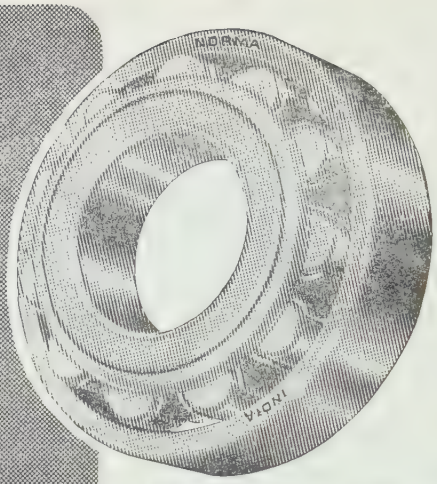

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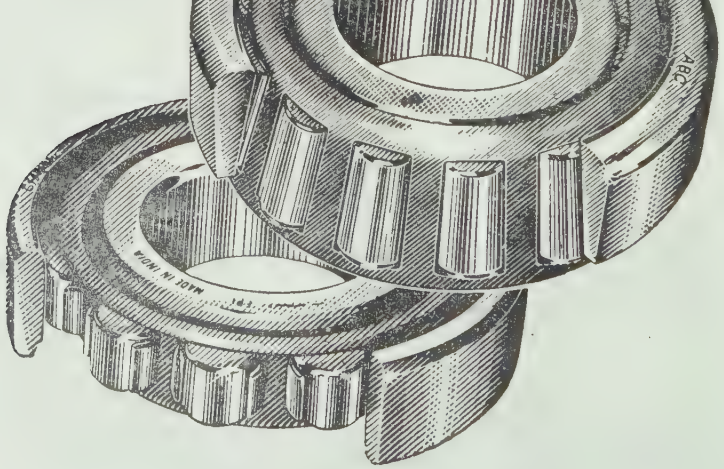


ually important applica-ons. Since defence require-ents are involved, foreign ppliers at the moment of isis may withhold the sup-ies thus holding the coun-y to ransom. A solution to is problem has to be found nce bearings are very vital rts of vital instruments. No ubt we are producing so-histicated aircraft for de-nce but to sustain them in r in combat-readiness in-ruments are vital.

A few observations regard-g bearings required for air-aft applications may not be t of place. These fall into o important categories. ne group of special bearings required for operation of rcraft control surfaces and e other group of bearings hich is no less special, be-ngs to the engines—mainly t engines. The aircraft con-ol bearings (mainly ball arings although in some untries needle rollers are voured) are permitted to be aded up to indenting loads nder severe aerobatics and e called upon to maintain ee rotationed properties nder severe and abrupt anges of climatic condi-ons. The engine bearings e called upon to function a peak performance so far loading intensity and tem-erature conditions are con-rned. The necessity of eeping the weight to the inimum helps to make the nditions more severe. The t engine bearings are ex-ected to function at high eeds and at high tempera-ures, sometimes under perio-ically reversing loads. Not nly special designs of com-onents are called for but pecial lubricating arrange-ent, which also carries out eat, is required. Special aterial with high metallur-cal purity is desired. Spe-al control has to be imposed om the initial stage of steel aking to the final stage of aring assembly. The test g operations on sample earings will be also almost ntinuous. These special earings are required in mod-rate quantities at the pre-nt moment, but they are f so vital importance that the manufacturing capability is essential to get rid of the dependence on imported bearings. This matter has to be thoroughly investigated and a solution found so that manufacturing capability of the bearings is made available in this country as quickly as possible.

There are other special classes of bearings which have come to be used in the modern world. These are used in various equipment associated with rocketry. Informations on the design and performance are classified. With the increasing use of rockets for defence and scientific purposes eventual high priority for the manufacture of suitable bearings may have to be considered in not too distant a date.

Although many of the standard bearings required by the shipbuilding industry are manufactured in this country, some special marine equipment requiring bearings are not being catered for. These have to be provided as the shipbuilding industry in India makes further progress. Here also requirements for defence have to be kept in mind.

The metallurgical industry, the paper industry and several other processing industries require special types of bearings, the manufacture of which has not yet been initiated in this country. These are larger bearings required in small quantities, which cannot be considered for mass production at present.

The requirements of the Railways, particularly of the axle box bearings, have been met substantially by the bearing industry and it is a matter of satisfaction to note that the industry can cater to the bearing requirements for rolling stock intended for export.

Mention has been made earlier about the limitations of equipment and machinery at present used by various units engaged in the manufacture of bearings. As all the units are engaged in plans to expand their manufacturing facilities, it is expected that plant and machinery which are to be installed will not suffer from limitations of productivity and workmanship. With the installation of high productive and high quality equipment we may be able to make our products more and more competitive.

So long as we continue to be dependent on import of raw material for the manufacture of bearings, we shall continue to be handicapped against foreign manufacturers who get their raw material practically next door. A start has been made to roll bars of bearing steel in the country from Indian steel. It may, however, take quite some time to install tube-making capability in the country. Even when such items are available here, the price factor of raw material will continue to remain adverse. The expanding bearing industry will have to take these factors into consideration and make proper plans to neutralise their effect on the competitive ability of Indian bearings. The sooner plans on these lines are given effect to, the better will be the position of the industry.

In view of the fact that the industry is called upon to make maximum utilisation of resources, a dependable study and analysis of consumers requirements is a necessity to plan the utilisation of resources. In the case of export such studies are more essential since, if supplies in foreign market are made in a haphazard manner, the regularly consuming industries abroad will not be in a mood to make a permanent arrangement. In this respect, the example of the Japanese manufacturers and exporters is worth emulating. In expanding such export markets the writer is convinced that representation of the industry, export houses and banks should be of Indian personnel alone although foreign help to a certain extent has to be taken.

It must be realised that a bearing being a precision engineered article, it requires a high grade of technical service. This the manufacturers' representative is best able to deliver. Sometimes in boosting foreign sales help of local people has to be taken, but the presence of manufacturers' representatives cannot be eliminated. The technical service during the introductory period must be very liberal so that the customer can feel that the makers can be relied upon to look after them and assist them in their difficulties. It has been reported that the Japanese representatives even go so far as to arrange for credits for their customers. The help of various government departments, beginning from passport authorities up to the commercial branches of embassies, has to be ensured. Other steps which can be taken after the ground work is over can be discussed and finalised.

It is clear that all types of bearings which are required in the country cannot be immediately made. Therefore in the near future it should be the effort of the bearing industry to earn partly or wholly the foreign exchange which is spent in importing the bearings not manufactured in this country. Furthermore, in order to keep pace with competitors in other countries the Indian bearing industry should be in a position to import latest specialised machine tools from any part of the world. Japan, the USSR and lately China are doing this in a big scale. A steady export performance of the industry could make the process of securing import licence for such capital goods easier. The technique which was adequate several years ago and in one set of market conditions may be a handicap to the manufacturers under the altered conditions of today. Therefore, there does not seem to be any alternative to modernisation, which in the present conditions entails responsibility to export. □

Rapid progress in production

By A Special Correspondent

THE ball and roller bearings industry has a good record to boast of during the past few years. The growth of the industry has come as a result of the growth in other engineering industries where ball bearings are used. Ball bearings are used for fitment in a number of industries manufacturing items such as electric fans, electric motors, power-driven pumps, automobiles, railway wagons, textile machinery, tractors and earthmoving machinery.

At the beginning of the Second Plan there was only one unit located in Jaipur. The installed capacity of the industry then was 6 lakh pieces per annum on a single shift basis. The production was of the order of 10 lakh pieces. By the end of the Second Plan, the production exceeded 2.4 million pieces which was the target set for the Plan. There was sizable expansion in the capacity after 1962 when it reached a level of 3.2 million pieces and the production was 3.9 million pieces. In 1966 the capacity was 11.5 million pieces, and the production 9.2 million.

Currently there are seven units licensed for a total annual capacity of about 22.6 million pieces. The installed capacity as at the end of 1971 was 18.9 million pieces, and the production 19 million pieces worth Rs 20 crores. The annual compound growth rate between 1951 and 1971 has been 18.8 per cent in respect of capacity, and 24.7 per cent in respect of production. In terms of capacity utilisation the industry has been performing well and currently the utilisation is 100 per cent in the organised sector. The Government has issued letters of intent to two companies in the private sector for the manufacture of ball and roller bearings. The capacity sanctioned for the new units is 11 million pieces. There are also 23 small-scale units whose total output in terms of value was estimated at Rs 72 lakhs in 1967. The anticipated production of the organised sector for 1973-74 has been placed at 21 million pieces. However, considering the growth in the installed capacity of the industry, and also utilisation of the capacity, it seems the industry would exceed the Fourth Plan target even before the end of the Plan period.

The demand for the various types of ball bearings is growing rapidly. At the en of the Fourth Plan the de mand is expected to rise about 25 million pieces pe annum.

Despite the rapid increas in indigenous productio there are substantial impor of ball and roller bearing In 1970-71 the imports wer of the order of Rs 9.4 crore as against the indigenous pr duction of Rs 20 crores. Th indicates the large scope fo import substitution. The im port of certain bearings ma be inevitable because th production may not be ec nomical on the basis of th demand for those bearing But there is no reason why joint effort should not b made by the industry and th Government to identify th types of bearings which ca be manufactured here. Th export performance of th industry is rather poor: it earnings were hardly Rs 2 lakhs in 1970-71. A deter mined effort will have to b made to boost the sales i markets abroad. □

Pipes and tubes industry

— A FEATURE

Steel pipes: Growth problems

By A Special Correspondent

THE steel pipes and tubes industry, one of the important engineering industries in the country, has developed during the past two decades.

The variety in steel pipes and tubes is large and it covers size, wall thickness, kind of steel used, type of joint, protective coating, manufacturing process and end-use. Based on the manufacturing process, steel tubes can be categorised as welded type and seamless type. With the improvements in different welding techniques, namely, electric fusion welding, electric resistance welding and submerged arc electric welding, welded tubes are rapidly replacing the seamless type. The use of seamless type is at present mainly confined to selected special applications.

Welded tubes of diameter over 20" are used in India mostly for penstocks and primary water mains. These are generally made by state fabricators. Line tubes used for main lines of water transmission are mostly of 10" and 12" in diameter, while those for oil lines are 8" to 20" in diameter. The Indian Standards Institution has developed standards for these tubes. Welded structural tubes and commercial tubes can be of various sizes. Commercial tubes used for conveyance of water and gas vary from ½" to 2" in diameter. Those for agricultural purposes are usually of 3" and 4" size, and for the tubular poles the sizes used are 4" to 8". Special tubes used in the manufacture of cycles, furniture, refrigerator equipment and transformers are generally made from cold rolled strips.

The pattern of industrialisation has a considerable influence on the level of demand for different end-products of steel. Broadly speaking, the demand for steel pipes and tubes grows in importance with emphasis on chemical and mineral oil industries in the scheme of industrial development. The somewhat steep increase in the demand for pipes and tubes in 1960 and 1961 was a consequence of the work on the construction of pipelines for oil (Naharkatiya-Barauni crude oil pipeline) and coke oven gas (Durgapur-Howrah pipeline for gas).

The pipes and tubes industry has been among the engineering industries where demand estimates have been on the high side. This resulted in sanctioning large capacities. As against the target of 9 lakh tonnes set for the Third Plan, the installed capacity of the industry at the end of the Plan was about 3 lakh tonnes per annum, and the level of production reached was of the order of 2.41 lakh tonnes. By the end of the Third Plan the industry was in good shape. The utilisation between 1960 to 1966 went up from 56 per cent to 96 per cent. This, despite the fact that about 1.2 lakh tonnes capacity was added during the six-year period. Then the downtrend started. Encouraged by the boom conditions in the industry and the prospects of growth, more entrepreneurs entered the field. The capacities then existing were also allowed expansion. Between 1966 to 1971, the capacities have been doubled by 3 lakh tonnes. But in the corresponding period the production came down by 2.97 lakh tonnes to 2.18 lakh tonnes. It is not surprising that the capacity utilisation showed a sharp decline from 94 per cent to 36 per cent.

The National Council of Applied Economic Research in a study made in 1968 had estimated the demand for steel pipes and tubes in 1970-71 at 418,170 tonnes. This consisted of welded pipes 282,580 tonnes, seamless steel pipes 109,340 tonnes and seamless alloy steel pipes 26,250 tonnes. In its recent study, *Demand for Steel*—

Table 1: Growth of the steel pipes and tubes industry: 1960 to 1971

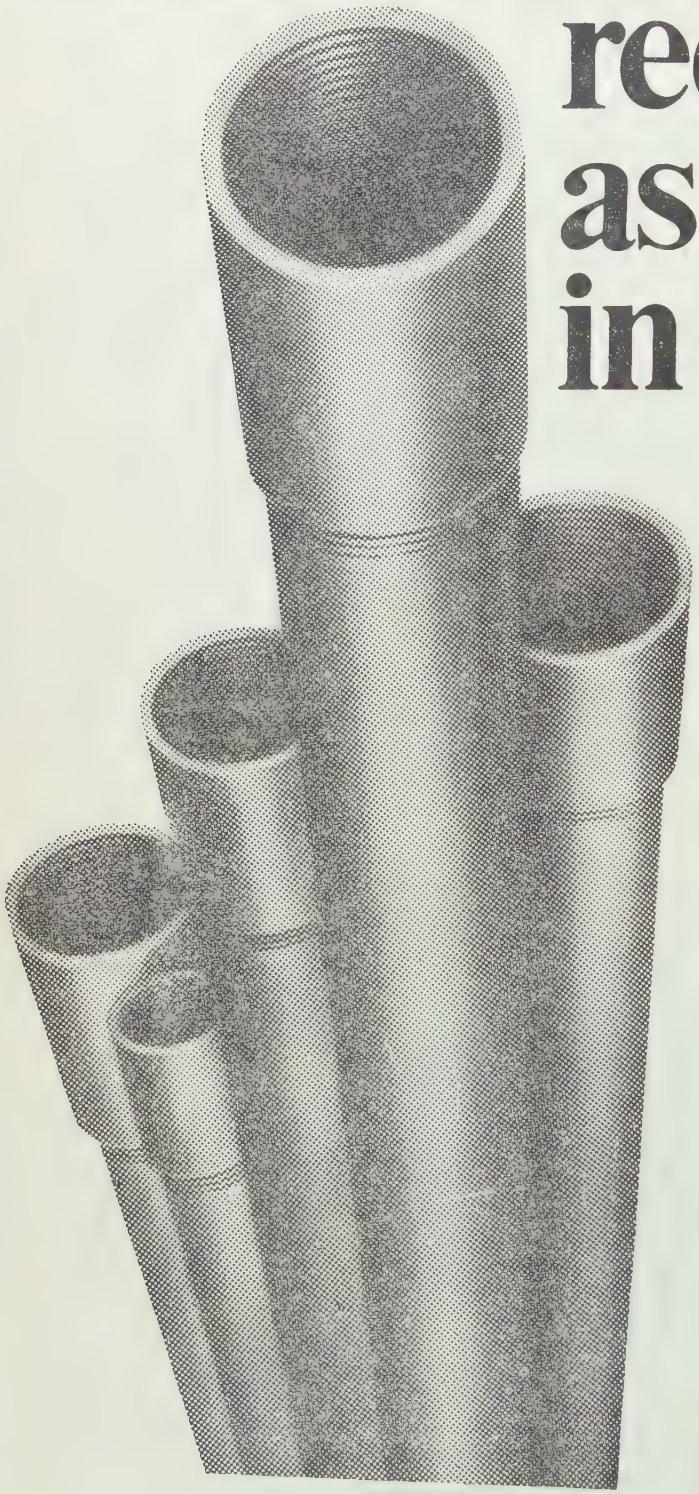
('000 tonnes)

Year	Steel pipes and tubes			Seamless tubes			Cast iron spun pipes		
	Capacity	Production	Capacity utilisation (per cent)	Capacity	Production	Capacity utilisation (per cent)	Capacity	Production	Capacity utilisation (per cent)
1960	187.3	104.7	55.9	..	..	..	..	..	..
1961	187.3	139.5	74.5	..	..	..	..	..	..
1962	187.3	155.5	83.0	..	..	..	..	..	..
1963	239.4	214.9	89.7	..	..	..	196.1	188.3	96.0
1964	281.9	234.2	83.1	30.0	15.2	50.7	193.0	207.3	107.4
1965	272.2	235.5	86.5	30.0	16.7	55.7	280.0	243.9	87.1
1966	314.5	297.1	94.5	30.0	21.4	71.3	282.4	235.5	83.4
1967	409.3	220.0	53.8	30.0	23.4	78.0	330.4	166.1	50.3
1968	409.3	255.4	62.4	30.0	24.7	82.3	438.4	133.1	30.4
1969	470.5	300.0	63.8	39.6	27.0	68.2	438.4	120.0	27.4
1970	484.0	215.6	44.5	39.6	29.3	74.0	438.4	172.9	39.4
1971	601.5	218.3	36.3	39.6	34.3	86.6	N.A.	N.A.	..
Annual compound rate of growth between 1960 and 1971 (per cent)	11.2	6.9	...	4.0 (a)	12.4 (a)	...	12.2 (b)	—1.2 (b)	..

NOTES: N.A.=Not available. (a) Relate to 1964 and 1971. (b) Relate to 1963 and 1970.

SOURCES: (1) For 1960 to 1967, Central Statistical Organisation, *Monthly Statistics of the Selected Industries of India*, New Delhi, Various issues.
(2) For 1968 to 1971, Ministry of Industrial Development, Internal Trade and Company Affairs, *Annual Report 1969-70 to 1971-72*, New Delhi.

Indian Tube receive Government's recognition as Pioneers in Exports



Indian Tube were among the recipients of Certificates of Merit awarded on 20th June 1972 by the Ministry of Foreign Trade, Government of India. The citation states that Indian Tube, "pioneers in the export of M.S. Pipes and Tubes have gradually developed their exports to a large number of countries. Although conditions in neighbouring countries in the Middle East and South East Asia are more favourable for export of this product from India, the firm has made consistent efforts to sell pipes and tubes to countries like the U.K. and the U.S.A., which require these products to special specifications. Their exports have increased from Rs. 139 lakhs in 1966-67 to Rs. 188 lakhs during 1968-69, a growth rate not achieved by any other firm in this line during this period". The certificate of Merit was awarded to the company "for being the best exporter of M.S. Pipes and Tubes" during the period.

HIGHLIGHTS OF THE COMPANY'S EXPORT RECORD —

In 1966-67, Indian Tube were not only the biggest Indian exporters of steel tubes but the biggest exporters in the entire field of engineering goods. In 1969-70, they established an all time record by exporting over 29,000 tonnes valued at Rs. 279 lakhs (f.o.b.) against 188 lakhs in the previous year, i.e. a growth of 48%.
The cumulative total of the company's exports upto 31. 3. 1972 is 116,000 tonnes valued at Rs. 10.77 crores.

INDIAN TUBE

THE INDIAN TUBE COMPANY LIMITED
A Tata-Stewarts and Lloyds Enterprise
CALCUTTA BOMBAY DELHI MADRAS AHMEDABAD KANPUR

ITC/125

975 and 1980, the NCAER has stimated the demand for eel tubes in 1975 and 1980 or domestic consumption and or exports at 6.8 lakh tonnes nd 11.8 lakh tonnes respecvely. An item-wise breakown of the aggregate deand is shown in Table 2.

The Indian Engineering ssociation has expressed the

Table 2: Sector-wise demand for steel pipes and tubes

(thousand tonnes)

	1969	1975	1980
Industrial offtake			
Seamless	23.1	47.6	101.6
Welded tubes	36.2	64.1	101.5
Non-industrial offtake			
Welded tubes	195.0	303.2	503.9
ERW pipes	38.0	60.0	100.0
Other large-diameter fabricated pipes	8.3	15.0	25.0
Exports			
Seamless tubes	2.1	10.0	20.0
Welded tubes	103.4	190.0	330.0

iew that since the consumption of steel tubes is found to e related to the ingot steel roduction, on the assumption of the achievement of he Fourth Plan steel target f 10.8 million tonnes, the domestic demand for steel tubes may be expected to be around lakh tonnes in 1973-74.

The steel pipes and tubes ndustry is worried about the aw material supplies position. The prices are going up. For 1,000 tonnes of steel pipes and tubes the steel coils needed are about 1,150 tonnes. The supplies from the indigenous producers are quoted at prices ranging from Rs 1,400 to Rs 1,450 per tonne. A year ago these prices were lower by at least ten per cent. In the case of imported varieties the prices range between Rs 1,900 and Rs 2,000 per tonne. A year ago these prices were lower by more than Rs 300 per tonne. In the case of raw materials supplies, imported materials constituted nearly 60 per cent. This inflated the cost of production of pipes.

The pipe manufacturers say that it takes nearly six months for them to get the imported quota of steel items. This is because steel is a canalised item. Owing to the shortage in domestic supplies the industry has to import steel. In the organised sector only one captive unit has been assured of steel supply. The others have to depend on imported supplies. Any cut

Table 3: India's exports of iron and steel pipes and tubes

Year	Exports of		Col. (1) as percentage of col. (2)
	Pipes and tubes (Rs. crores)	Engineering goods (Rs. crores)	
	(1)	(2)	(3)
1960-61	0.3	10.5	2.9
1962-63	0.1	14.9	0.7
1963-64	0.6	21.1	2.8
1964-65	1.3	26.5	4.9
1965-66	3.3	29.8	11.1
1966-67	5.1	31.1	16.4
1967-68	6.2	41.5	14.9
1968-69	11.6	85.0	13.6
1969-70	13.1	106.4	12.3
1970-71	9.3	116.6	8.0
1971-72*	7.5	125.0	6.0

NOTES: * Provisional.
Figures from 1960-61 to 1965-66 and for 1971-72 refer to M.S. pipes and tubes only (including fittings). Figures from 1966-67 to 1970-71 also include cast iron pipes and fittings, cast iron spun pipes and fittings.

SOURCES: (1) Indian Engineering Association, Engineering Export Promotion Council, *News Bulletin*, July 1969, July 1970 and September 1971.
(2) Indian Engineering Association, Engineering Export Promotion Council, *Home Bulletin* (various issues).

PROFILE

Pipes and tubes

PIPES and tubes are required for many purposes and for many industries. Water tubes and structural tubings, boiler and high pressure steel tubes, tubes for oil-well casings, ball bearing tubes and water-well tube casings, furniture tubes and bicycle tubes are some of the important types of tubes supplied by the industry.

Though pipe and tube-making has been known to man from the distant past, the industry as we know it today is about 150 years old. The pipes and tubes industry in the country is essentially a development after the achievement of Independence. Manufacture in the first decade of free India was largely confined to making pipes intended for conveying water, steam and gas, the traditional uses to which pipes have been generally put. Sophisticated pipe and tube making is a growth from the Second Plan onwards. With increasing industrialisation the demand for pipes and tubes has grown. As against the target of 9 lakh tonnes set for the Third Plan, the installed capacity of the steel pipes and tubes industry at the end of the Plan was about 3.08 lakh tonnes per annum. The level of production reached was 2.41 lakh tonnes.

By the end of 1971, the capacity of the industry was of the order of 6.01 lakh tonnes. The production during the year, at 2.18 lakh tonnes, was at the same level as in 1963 when the installed capacity was 2.39 lakh tonnes. The peak was reached in 1969 when the production touched three lakh tonnes. With the increase in capacity and fall in production, the capacity utilisation has come down to 36.3 per cent. The capacity utilisation has been showing a persistent downtrend and at the present level it has touched a new low. In seamless tubes the capacity is 39,000 tonnes and production 34,000 tonnes, indicating a utilisation of 86.6 per cent. For cast iron spun pipes the capacity in 1970 was 4.38 lakh tonnes, and production 1.72 lakh tonnes. The capacity utilisation was 39.4 per cent.

There are 14 units producing steel pipes and tubes. In the private sector units the range covered is from ½" to 6" in welded and seamless qualities. Hindustan Steel Limited manufactures tubes in 8 to 18 inches size range. Its capacity is 1.20 lakh tonnes per year.

It is estimated that by 1973-74 about seven lakh tonnes of steel pipes and tubes will be required for meeting the demand from industrial and other sectors. The Fourth Plan makes a provision of Rs 7.41 crores for the setting up of a seamless tube plant at Bhilai. It will produce tubes in sizes which are not made in the country at present.

The industry is one of the major earners of foreign exchange. The exports had touched a level of Rs 11.26 crores in 1969-70 but came down to Rs 7.01 crores subsequently.

The steel pipes and tubes manufacturers say that shortages in indigenous supplies of raw materials, particularly in skelp and hot and cold rolled strips, are the main constraints on the development of the industry.

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ZENITH black & galvanised steel pipes—incorporating the international know-how of Mannesmann Meer AG., West Germany—come in light, medium and heavy grades to BS-1387, to meet varying customer requirements. ZENITH STEEL PIPES won the Government of India's coveted Certificate of Merit for Outstanding Export Performance.

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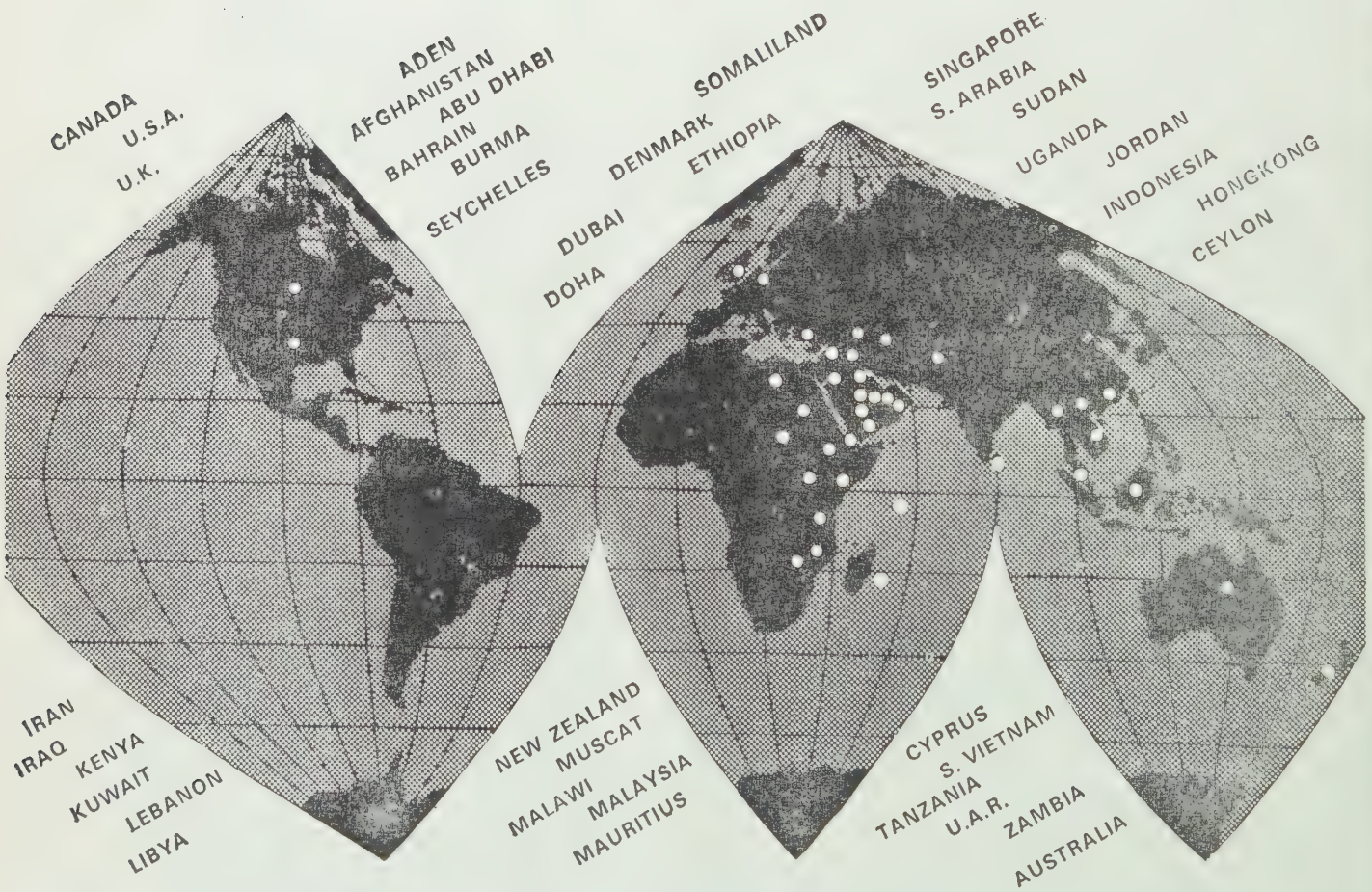
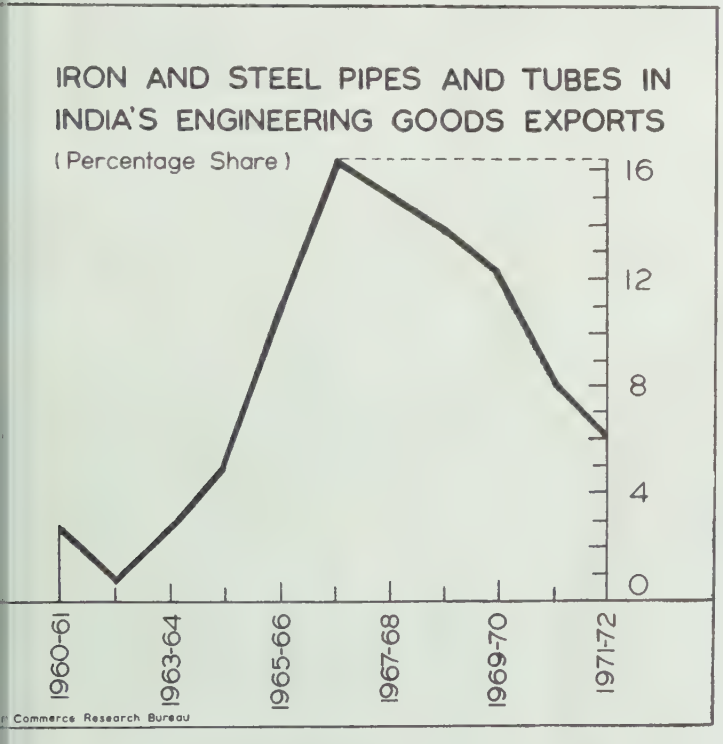


the production by the pub- sector units in the needed rieties adds to the difficul- es of the pipe manufac- rers. Because of the delay in ocuring the raw materials, e manufacturing units have stagger the production. ie factory has to be in pro- ction all round the year th the result the utilisation the capacity is below 40 r cent.

The industry complains at the spare parts and tools quired for its plants and uipment are not available time.

There is no price control on el tubes but the Govern- nt is a direct buyer of at st 20 per cent of the pro- ction. Any attempt to in- ease the prices is frowned on by the Government's rchasing authorities. About per cent of the pipes and pes are purchased for water



pply and irrigation pur- ses, 20 per cent for structu- uses and about 10 per cent other uses by the indus- .

The economic size of a unit the steel pipes and tubes ustry is about 30,000 tonnes year. At the current level prices this requires an in- vestment of about Rs 25 crores to Rs 3 crores.

There is sizable import of tubes and pipes, particularly in seamless and welded categories. In 1970-71, the imports of tubes and pipes other than cast iron were of the order of 30,434 tonnes valued at Rs 10.56 crores. These are mainly for oil wells and the chemical industry. Capacity has not yet been set up for production of some of these pipes. The demand for some of the imported items is not adequate to commence production here.

The target for the export of steel pipes and tubes has been set at Rs 15 crores to be achieved by 1973-74. The pipe manufacturers are confident of hitting the target provided the raw material supplies are assured. There is a great potential for export as demand for steel pipes and tubes is rising rapidly all over the world. In terms of quality the Indian products are accepted all over the world. A determined effort by the industry and the Government should help India boost up its export earnings on this item which currently account for six per cent of the engineering goods exports. □

Growing demand for PVC pipes

By A Special Correspondent

THE shortage of steel and the increase in its prices led to a search for an alternative raw material. In the pipes and tubes industry an alternative has been found. Polyvinyl Chloride (PVC) has emerged as an alternative raw material. PVC is a hard, tough, transparent, thermoplastic resin characterised by high inherent strength. It can be plasticised to a straight degree of flexibility and still retain appreciable strength. It has an exceptional resistance to many chemicals such as alkalis, alcohol, acids and aliphatic hydrocarbons.

An important characteristic of PVC is that it can be processed by almost all the known methods of fabrication such as injection moulding, blow-moulding and extrusion. Because of its versatility PVC can be fabricated into products which are rigid, such as pipes, sheets, glass-like bottles or those which are flexible, such as shower curtains, table sheets and cables.

The history of PVC pipes dates back to 1930 when Germany first introduced them for transmission of potable water. Over the last 40 years these pipes have gained popularity the world over as material for potable water supply. These pipes are now extensively used in Japan, Italy, the UK, West Germany, Holland and the US. On a rough estimate, about 60 per cent of the new pipes used in Western Europe are rigid PVC pipes.

The first PVC pipe used in India, as a demonstration by a foreign firm, for potable water supply was at Chatarpur, about nine miles from Delhi, in 1962. Tamil Nadu was the first State to use rigid PVC pipes on a large scale, in sizes ranging from 20 mm to 280 mm, for both rural and urban water supply schemes. The Tamil Nadu Housing Board is reported to have used over 200 km of PVC pipes in sizes ranging from 16 mm to 200 mm. The use of PVC pipes in other States followed suit. Jammu and Kashmir, Andhra Pradesh, Assam, Kerala, Mysore and Maharashtra have begun using PVC pipes in their urban and rural water supply schemes.

The commercial production of PVC tubes in India commenced in 1967. There are currently five major manufacturers according to the DGTD list: two in Bombay, two in Madras and one in Calcutta. The present utilisation of PVC pipes in our country for potable water supply is stated to be around 1,500 tonnes per year. By the end of 1973 this might go up to a level of 3,000 tonnes per year.

The approval by the Central Public Health Research Institute, Nagpur, and by the public health engineering departments of various State Governments has helped in encouraging the use of PVC pipes. The Indian Standards Institution laid down standards for PVC pipes in 1968. After satisfying itself that all the tests suggested by it are carried out properly, the ISI has permitted two manufacturing companies to use certification marks on pipes produced by them.

The PVC pipe manufacturers contend that there are many advantages in switching over to PVC pipes. The foremost is the cost factor. In the total cost of any water supply scheme 50 to 55 per cent is towards the cost of pipes. This can be brought

Save upto 30% in plumbing cost with PVC Pipes*!

Take a look at this cost comparison chart for plumbing at a house in Madras where PVC pipes have been used.

Particulars	Cost of pipes & fittings P.V.C.	G.I.
(a) Cost of pipes 25 mm 36 metres 20 mm 44 metres	Rs. 258.80	Rs. 426.48
Cost of fittings 25 & 20 mm	Rs. 89.81	Rs. 109.48
(b) Labour charges for installation	Rs. 105.60	Rs. 185.00
Total of (a) and (b)	Rs. 454.21	Rs. 720.96
(c) Metal fittings such as Tap and Valves	Rs. 171.00	Rs. 171.00
Total Cost (a) + (b) + (c)	Rs. 625.21	Rs. 891.96
(d) Savings:		
(i) In cost of pipes, fittings and labour charges	Rs. 720.96 — Rs. 454.21 = Rs. 266.75 or 37%	
(ii) In total cost of the installation	Rs. 891.96 — Rs. 625.21 = Rs. 266.75 or 29.9%	

And remember, that apart from the initial saving, you also save substantially over the years because PVC pipes need no maintenance, do not corrode and retain their internal bore.

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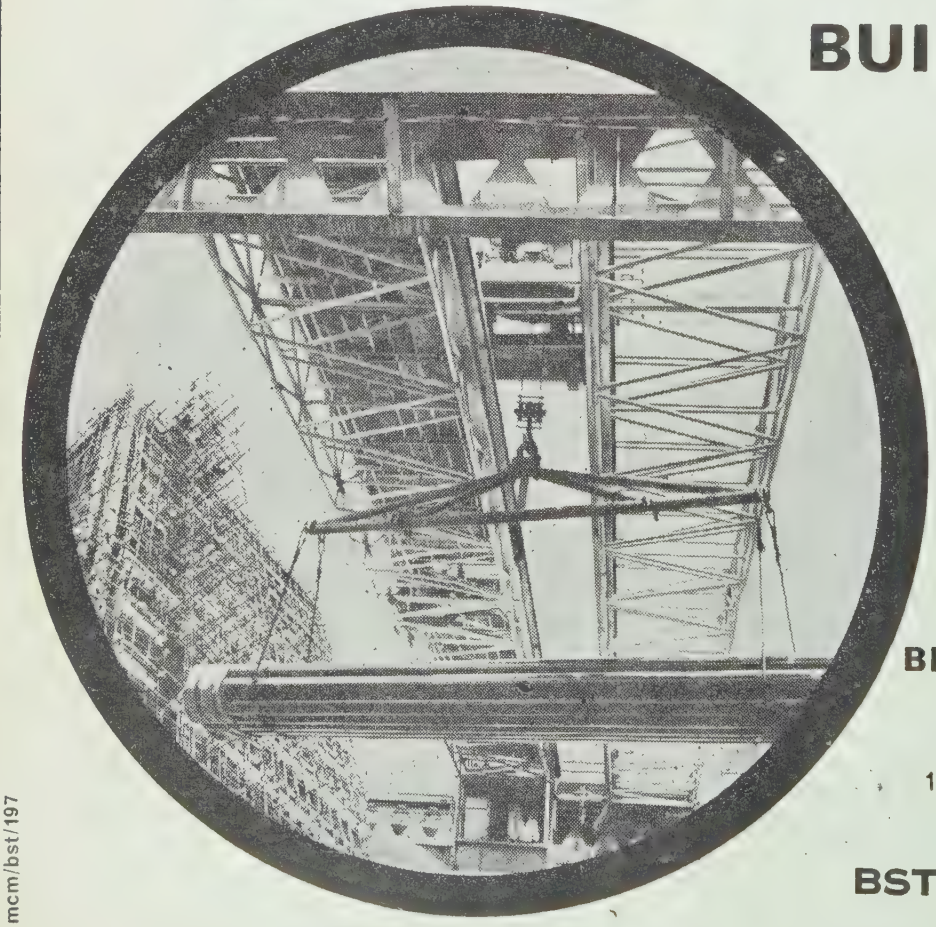

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own with the use of PVC pes. For instance, a 4" cast-on pipe is quoted at Rs 23 r metre, but for a PVC pe the cost is hardly s 13.60 per metre. The de-very time for PVC pipes is so much shorter than that r galvanised or cast-iron pes.

The PVC pipes are stated be nearly one-sixth of the eight of the conventional pes. They are, therefore, sier to handle and install. his ensures considerable vings in transportation, andling and installation sts.

One of the major con-derations in installing pipe-nes is the ability of the peline to resist corrosion id contamination. PVC pipes have elastic properties and their resistance to deformation resulting from earth movements is superior compared to conventional pipe materials. The maintenance costs of the PVC pipes are lower than for conventional materials. These pipes do not rust and have a good outdoor weather performance.

The PVC manufacturers contend that more use of PVC pipes could lead to savings in import costs. Each conventional piping material has an import component either in its manufacture or in its installation. Asbestos cement pressure pipes require imported asbestos fibre. Galvanised pipes require zinc for galvanising, and cast-iron pipes require lead for making joints. At times indigenous production of steel is not sufficient to meet the country's demands warranting import of steel for the manufacture of galvanised pipes. For the PVC pipes no import of any material is involved Polyvinyl Chloride is indigenously produced. The raw material is adequate to meet the demands of the pipe manufacturers.

PVC pipes are also exchange-earners. This is significant in view of the fact that the production of PVC pipes commenced only five years ago. There is a big market in West Asia for these pipes as the public health authorities in some of the countries have approved PVC pipes for installation in water supply schemes. Recently for installation of a pipeline in a West Asian country, the UK firm which was entrusted with the job invited collaboration from an Indian manufacturer for supply of pipes. This only shows that the quality and the prices of Indian PVC pipes compare favourably with those manufactured in the West.

There is no doubt that PVC pipes will be playing a more important role in the water supply schemes in the country. It has been estimated that it will cost about Rs 1,200 crores to provide water supply and sewage facilities to the entire population. With the increase in the cost of conventional piping material, there is greater scope for PVC pipes. □

Major manufacturers

teel pipes and fittings

Bengal Iron Works (P) Ltd, , Ganesh Chandra Avenue, alcutta.

Bihar National Engg Works, atu Rd, Ranchi.

Bharat Steel Tubes Ltd, 17, arliament Street, New elhi-1.

Calcutta Steel & Metals Pvt d, 22 Canning St, Calcutta.

Great Eastern Mechanical orks Ltd, Ichapore Rd, ntragachi, Howrah.

Guest Keen Williams Ltd, Andul Road, Shalimar, owrah.

Howrah Engg & Galvaniz-g Works, 68 Banaras Road, owrah.

India Tube Mills & Metals dustries Pvt Ltd, 126, arayan Dhuru St, Bombay.

Indian Iron & Steel Co Ltd, , Mission Row, Calcutta.

Indian Tube Co (1935) Ltd, , Chowringhee Road, Cal-tta.

India Watertap Mfg, 5, R. S. agla Lane, Calcutta-2.

J. K. Steel Ltd, 7, Council ouse Street, Calcutta.

Khandelwal Tubes Pvt Ltd, Khandelwal Bhavan, D. N. Road, Bombay-1.

Metal and Alloys Industries, Udyognagar, Tinsukhia.

Metal Trust (P) Ltd, 19, Maharshi Debendra Road, Calcutta-7.

Serampore Industries Pvt Ltd, Serampore (West Bengal).

Star Sheet Metal Works (P) Ltd, 1B, Jadu Mitra Lane, Calcutta-4.

Steel Fittings Mfg Co Pvt Ltd, 67-B, Netaji Subhas Road, Calcutta.

Supernova Steel Pipe Industries, 29-A-34, Piru Lane, Bombay-9.

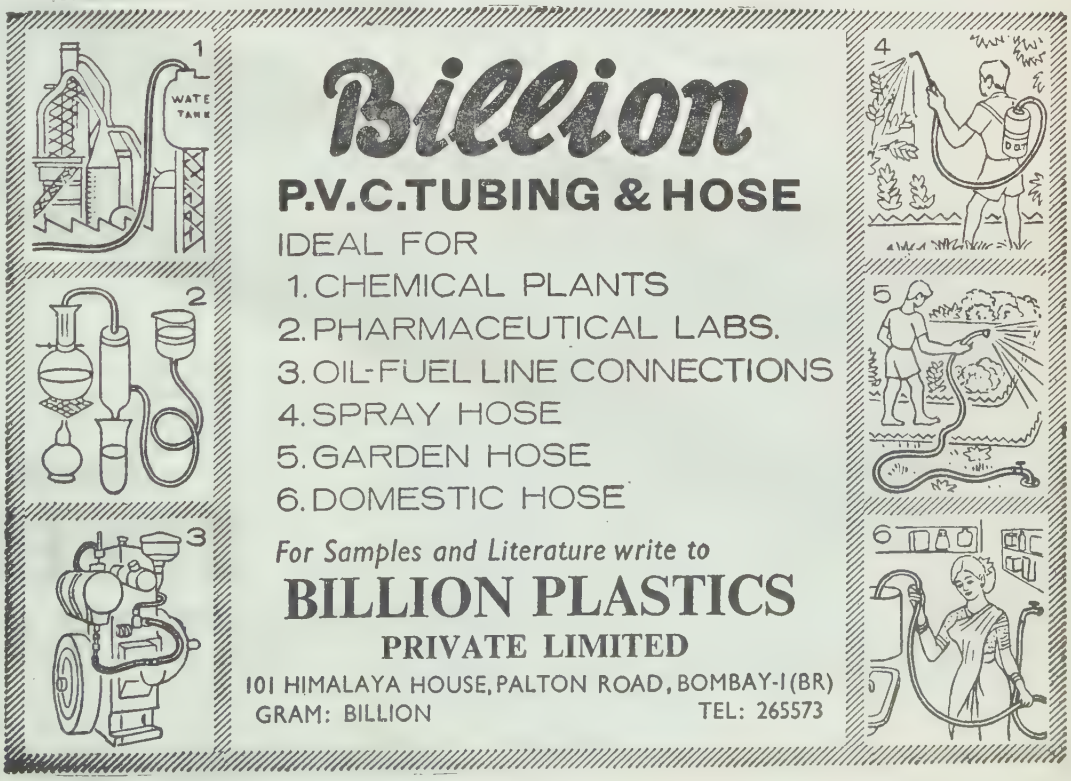
PVC pipes and fittings

Ahmedabad Manufacturing & Calico Printing Co Ltd, Anik Chambers, Bombay.

Chemicals & Plastics (I) Ltd, Dhun Building, 175/1, Mount Road, Madras.

Garware Plastics (P) Ltd, 135, Dr Annie Besant Road, Worli, Bombay-18.

Wavin India Ltd, Ambattur Industrial Estate, Madras-58. □



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Growth of air cargo

— A FEATURE

An aid for exports

By Eric Pereira

THERE is a tribe in the South Seas or somewhere, who believe that all the material wealth of our affluent society comes from the cargo inside the bellies of the silver birds coming in from the white man's ju-ju land. They give practical demonstration to this belief by setting up totems to entice the bulging birds to disgorge some of the loot in the village clearing.

For us the cargo space of our national airlines is important. The cargo space provided by Air-India on its worldwide network is in fact part of our country's resources.

In today's concept, we must export to survive. Our Prime Minister has said that self-reliance is a possibility, and the mood of our nation is ready to achieve it. We cannot, however, hope to achieve any degree of self-reliance without our exports.

We must, therefore, maximise our earnings of foreign exchange, and we do this only when we use our national carrier for our air exports and thereby save foreign exchange.

Air-India, as the national carrier, is not unmindful of its responsibility towards the promotion of our country's exports. From time to time, the exports of various commodities have been promoted and low commodity rates introduced, which have made us competitive in world markets.

The introduction of these rates, in the normal course, has to be through the IATA machinery. IATA is the association of the international airlines. Cargo rates can be filed by any carrier for a specific commodity. The rates become effective if they have the unanimous approval of all the other member-airlines. Unfortunately, what very often happens is that, the interest of one airline or its national interest may clash with the interest of the carrier filing the specific commodity rates, with the result that the rates are protested and cannot become effective. While the IATA rate fixing machinery is cumbersome and has its shortcomings, it is the only method by which the international airline rates can be fixed. The alternative would be bilateral agreements between the countries concerned and this would be far more cumbersome and difficult.

The markets of Europe are even further away from our country when we think in terms of surface transportation. Because of this, many of our exporters have begun to depend on air transportation. However, it is not possible to compare the surface transportation rates with air freight. The two concepts are completely different. In the first place, sea transportation today takes anything from six to eight weeks from India to Europe. On the other hand, with air transportation, the goods, in most cases, reach their destination within 48 hours. There are other savings apart from time. There are savings in packing, in insurance, in warehousing costs and savings in inventories. Therefore, if air transportation cost has to be compared with sea or surface transportation cost, one must use the total cost concept, that is, take into account all the various economies that are possible with air transportation. If this is done in most cases, air transportation does become a possibility for our exports.

So far, a large proportion of the air cargo we carry is still only cargo which is or an urgent nature. We must broaden the base; we must think of other commodities for air transportation which, in relation to their value or f.o.b. cost, can stand air freight charges.

Apart from perishables like fruits and vegetables, the importer today expects even commodities like shoes and garments to arrive in what he now calls 'factory-fresh' condition.

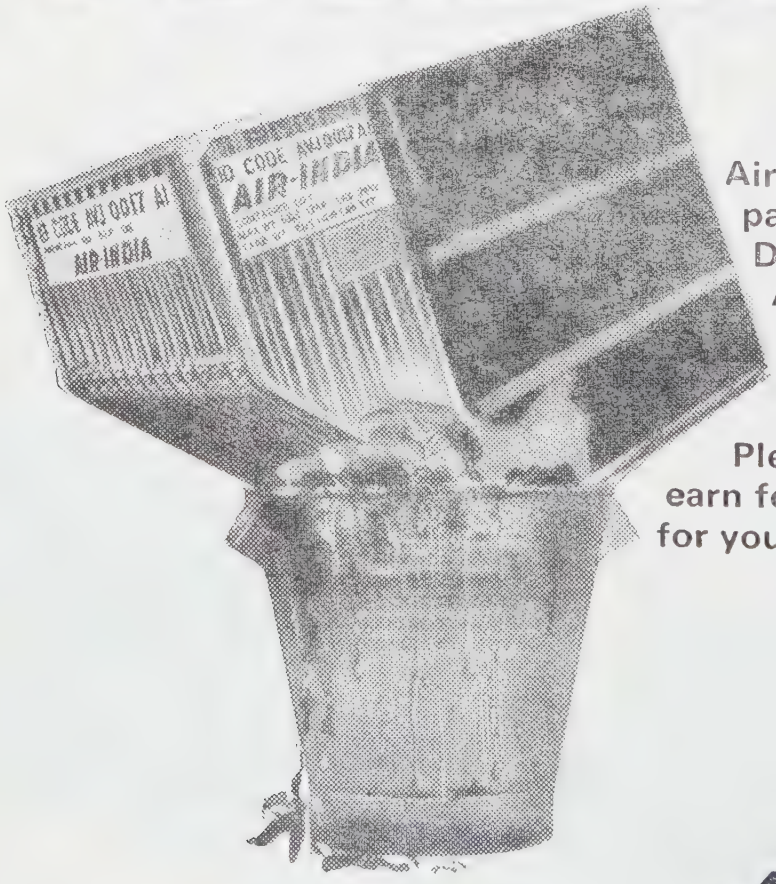
As mentioned earlier, we need our exports for our survival. We have therefore got to pay far more attention to our export promotion and marketing. We must not hesitate to use air transportation if it helps with our exports.

A number of our small-scale industries produce high labour intensive exports like handicrafts and silks which

Cargo being loaded on an Air-India plane

Mr Pereira is commercial manager, cargo, Air-India.

Don't waste your country's resources!



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ind a ready market in Europe. The snob value of hese items is accentuated ecause of the price. Some f these commodities we annot afford to sell in the narkets of Europe for daily tilitarian purposes. They ave to be sold to restrictive uyers who appreciate their alue in terms of their cost. o explain, it is quite easy oday for Europe to produce achine-made carpets which ay even be of better quality nd more durable than our andmade carpets. Still, our andmade carpets continue o enjoy a prestige well bove that of machine-made arpets and therefore can ttract a higher price and a atisfactory demand.

If the prices of commodities such as silks, handmade carpets and ivory tatues, are drastically reduced, we would also lose some f our markets as these commodities lose their snob appeal. For example, if French erfumes were available at ery low prices, few people ould really be interested in nem. Today, the French perme or French Champagne Russian Caviar, to a large xtent, maintain their appeal ecause of the high prices.

On the same lines, when we plan our export promotion and marketing, we must realise that it is not only the lowest price which will be competitive. If we maintain the quality in our products, if we keep to our delivery schedules, if we anticipate correctly the changing fashions and requirements of the markets, and plan our production correctly, we can increase our exports and these exports can bear air freight rates.

The air transportation must form a part of the entire export promotion and marketing strategy of the organisation. The marketing manager must re-organise his whole distribution plan and carefully analyse his costing on packaging and inventories and his delivery dates.

It is not easy for organisations used to exporting by surface transportation to revolutionise their thinking and now switch over to air transportation. In many cases, they react immediately to the high cost of air freight. This reaction is due to the fact that the comparison is made of merely the air freight rate per kilo or per cubic foot with the sea freight rates. On account of this, so far, only a very small portion of approximately 4 to 5 per cent of our total exports move by air and most of these consist of cargo which is needed urgently. The intention is not of merely to transfer our sea or surface exports to the airlines. This becomes a worthwhile exercise only if by doing this, we can increase our exports. If the customer is happy by getting his goods on time and in, what has been referred to earlier as, 'factory-fresh' condition, we can expect repeat orders and boost our exports

Labour cost is increasing throughout the world, more so in the US and the West European countries, which are important market areas for us. With the high labour cost involved, many importers are now anxious that their goods are received straight from the factory to their showroom, without incurring additional expenditure on unpacking, cleaning and for the preparation of the goods for display. For example, in the case of garments, the importers expect to receive the garments from the aircraft and display them in the showroom without pressing.

Therefore, once the importer and exporter realises fully and completely the various savings that air transportation has to offer, they appreciate the benefits and begin to realise that the total cost when exporting by air can become comparable with the total cost of surface transportation. Already today most commodities which are charged for sea transportation on an *ad valorem* basis, can easily bear air freight rates and most of these commodities have begun to move by air. We must realise that under the present circumstances when we have to rely less and less on foreign aid, we can only do so by increasing our exports and our foreign exchange earnings. □

Aerodromes in India

I. International aerodromes

Bombay, Calcutta, Delhi, and Madras.

II. Major aerodromes

Agartala, Ahmedabad, Amritsar, Begumpet, Delhi (Safdar Jung), Gauhati, Jaipur, Lucknow, Nagpur, Patna and Tiruchirapalli.

III. Intermediate aerodromes

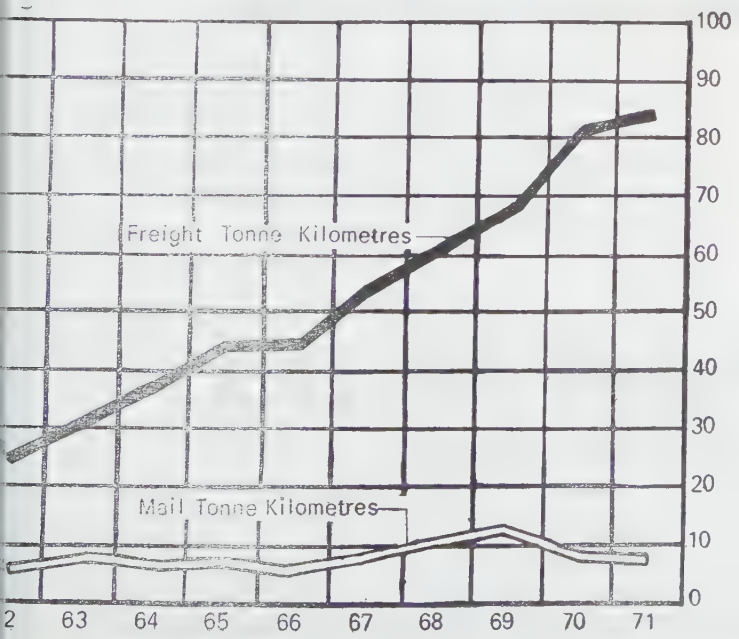
Aurangabad, Balurghat, Baroda, Behala, Belgaum, Bhavnagar, Bhuntar (Kulu), Bhopal, Bhubaneswar, Bhuj, Bombay (Juhu), Coimbatore, Gaya, Indore, Junagadh (Keshod), Kailashahar, Kamalpur, Kandla, Khajuraho, Khowai, Kota, Kumbhigram, Madurai, Mangalore (Bajpe), Mohanbari, Nagagul (Nadirgul), Gliderdrome (Hyderabad), North Lakhimpur (Lilabari), Pantnagar (Phoolbagh), Porbandar, Port Blair, Rajkot, Ranchi, Trivandrum, Tulihal (Imphal), Udaipur, Varanasi (Banaras), Vijayawada and Visakhapatnam.

IV. Minor aerodromes

Akola, Bilaspur, Chakulia, Cooch-Behar, Cuddappah, Donakonda, Hadapsar (Gliderdrome, Poona), Jhansi, Harsuguda, Jabalpur, Kanpur (Civil), Khandwa, Kolhapur, Lalitpur, Malda, Muzaffarpur (Rewaghat), Mysore, Palanpur (Deesa), Panagarh, Panna, Passighat, Raipur, Rajahmundry, Ramnad, Raxaul, Rupsi, Satna, Shella, Sholapur, Tanjore, Vellore, Warangal.

ail and freight tonne kilometres own by Air-India

nne kilometres (million)



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Need to utilise potential

By A Special Correspondent

JR efforts to plug loop- holes in the drain of eign exchange seem to be f-hearted. This is the only clusion one can derive m the scant attention paid the drain caused by trans- t of air cargo to and from e by carriers from abroad. surprising aspect of this is t some of the public sector anisations like the State ding Corporation invite ders for air transport of ds in which foreign air- s not only participate but rticipate successfully inst Air-India.

The practice of inviting ders for air cargo is a ic of the past which con- ues because of the inabi- of some quarters in the blic sector organisations or the government to adapt new situations. The past actice is continued unmind- of the repercussions on interests of this country. is is in contrast to the itude of foreign govern- nts which ensure that not ly products of their domes- industries are bought ainst tied credits but also at these goods are trans- rted by carriers named by em. Needless to say that the case of air cargo the eign parties choose the rlines belonging to their untry.

The contention that ten- rs are invited to cut down e costs is fallacious. The freight rates are standard tes. In any case if the tes are high the Union overnment is there to terfere. It can direct r-India—the national air rrier—to cut down the tes or to charge certain tes as was done in the se of transport of goods to angladesh recently. In any case it should not be difficult for the government to set up a machinery which can go into the question of the air freight rates in respect of items which the public sector organisations consider high. Air-India is not insensitive to the needs of promoting air cargo by freight rates concessions. It has introduced a number of commodity rates between India and overseas destinations.

This is not to suggest that we should not make use of the facilities made available by foreign carriers. That would be an unworkable idea. But if foreign governments and suppliers, as a matter of policy, patronise their own national lines, there is nothing wrong in our pursuing the same type of policy. If New Delhi, for instance, can encourage travel by Air-India by giving certain concessions without causing a murmur, there is no reason to fear that purposeful patronisation of the national airline for the transport of cargo would lead to any protests.

This apart, though air transport of cargo is growing, there is as yet inadequate awareness among businessmen and industrialists of its potential benefits. There is sound economics in the import by air and some high priced raw materials. The inventory holding is becoming costly with interest rates ranging from 10 to 12 per cent or above. In some cases the inventory build up for imported raw materials is of three to six months duration. With air cargo facility the inventory holding can be reduced to a period of hardly two weeks. This would also increase the capacity of the importers to purchase goods according to their choice. Fresh goods can be imported. There would be more choice for the local importers in the case of new arrivals in the markets abroad.

On the export front also there are items where the air transport potential needs to be utilised more fully. The commodities currently exported by air include handicrafts carpets, rugs, fruits, vegetables, meat, readymade garments, leather goods, sandalwood oil, jewellery and gramophone parts. An encouraging trend is that new commodities and items are entering the air cargo list. Machine tools, automobile parts, transistor radios, data processing machinery, electronic equipment and components and IBM machines are some of these items.

Because of the high cost of storage in foreign countries, the foreign buyers want to import the goods from here in a quantity that does not add up to the selling costs. In the case of readymade garments for Christmas sales the foreign importers prefer air transport rather than sea voyages which take at least four weeks. The air cargo goods are there in the departmental store in London within 48 hours of leaving the factory in Bombay or Calcutta.

It is in this context that the Operations Research Group, Baroda, in its survey of overseas transport and freight structure observed that air cargo costs are relatively high per unit of the weight, but when the gains from speed for whatever reasons are high and when simplified packing and relative freedom from pilferage are important, air transport may be the most economic form of transport.

There are of course limits to the extent to which commodities can bear the higher costs. The percentage ratio of air freight to f.o.b. value is the appropriate measure in assessing those limits. There is also a view that air freight costs have to be taken into account in the context of total costs. But the time factor can also be quite important for importer here or abroad. This is particularly so when not merely consumer goods but raw materials and equipment for plants are involved. Factory stoppages on account of lack of specialised components and parts in the local market can be reduced with import by air.

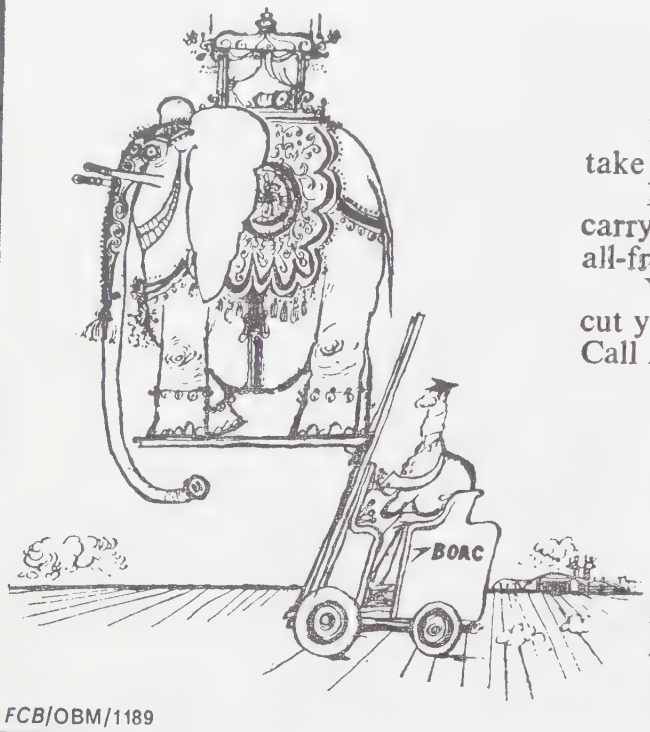
Air-India accounts for nearly 60 per cent of the air cargo movement from and to India. According to the survey by the Operations Research Group completed

Trend of cargo carried by domestic services

Year	Hours flown	Kilo-metres flown	Freight carried (tonnes)	Mail carried (tonnes)	Capacity tonne kilo-metres offered	Revenue tonne kilo-metres flown
	Number	Thousands			Thousands	
1959 ..	131,397	39,817	33,504	6,825	197,754	125,277
1960 ..	133,648	41,424	38,206	6,817	242,869	146,067
1961 ..	138,450	44,380	40,070	7,534	313,694	170,249
1962 ..	131,705	45,204	37,704	8,158	358,127	191,737
1963 ..	129,305	46,904	37,746	9,101	399,933	220,260
1964 ..	126,852	49,024	32,516	9,977	449,725	254,607
1965 ..	120,642	47,986	26,334	10,524	465,585	262,065
1966 ..	124,257	49,782	21,259	10,512	476,566	272,205
1967 ..	131,144	56,087	23,693	11,185	590,909	316,507
1968 ..	135,425	60,047	25,394	11,691	636,346	353,263
1969 ..	150,483	66,559	31,915	12,162	702,216	408,057
1970 ..	147,728	65,691	32,637	11,896	709,230	438,988
1971*..	123,414	57,004	28,494	10,282	726,370	406,650

* Estimated.

Anything goes!



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two years ago nearly per rent of India's ex- move by air. The share ss than two per cent in case of imports. In ex-, Bombay airport ac- ts for nearly 60 per cent wed by Madras, Calcutta Delhi.

e inward and outward ement of air cargo in- ng mail by Air-India unts to about 1.5 million er month. Air-India has ights per week. Trans- of export cargo by Air- amounted to 52.8 lakh h 1970 which rose to 63.6 kg in 1971. The growth export cargo by Air- was higher than the th rate of exports by the d airlines. During the period import cargo ement increased from 36 kg to 46.3 lakh kg.

me of the exporters have mes demanded reduction argo freight rates. The ie, however, contends these rates have been mined on the basis of mic operations of the rtaking and on the basis hat the traffic can bear. ny case reduction in t rates may not im- the ability of the local cts to compete in the markets abroad to any significant extent. Effort has to be made to augment the foreign exchange earnings through services like transport and insurance.

Efforts are being made by Air-India as also the air cargo agents to improve the movement of cargo. The shippers and cargo agents are critical of the procedural delays by the customs authorities. For instance, in the case of a shipment of prefabricated mica to the US from Calcutta the shipment was cancelled by the customs authorities on the technical ground that the export licence had expired owing to flight delay. The result was that all the documents were sent again to the authorities concerned and it took two days more to airlift the goods. The government must pay more attention to eliminating such delays which can prove quite costly to our export efforts.

There have been recently two significant instances which highlight the ability of our national carrier to carry cargo of any nature. Two weeks ago, Air-India flew two Gnats and one Kiran aircraft by a special flight of the 707 plane for the forthcoming Farnborough show in the UK. This is for the first time that an Asian country is participating in the show. The exhibits were transported in knocked down condition but there were many problems of loading. Answers had to be found to the concentrated weight and extreme dimensions of the planes. The job was completed within a short time though at one stage it was thought that the task might be impossible.

Another instance was the bringing in of some urgently needed equipment for the Tarapur atomic power station in May this year. Three pieces of 11 tonnes each and three pieces of five to six tonnes each were brought in two flights from Chicago.

Air-India is building up its capacity as a cargo carrier through facilities such as palletised cargo operations. It has expanded its cargo warehousing facilities at Bombay, London and New York airports.

The transport of air cargo not only for overseas destinations but also in domestic sphere needs to be encouraged. The fact that the country has got a network of four international aerodromes, 10 major aerodromes, 38 intermediate aerodromes, and 32 minor aerodromes is indicative of the expansion in civil aviation facilities in the country.

Despite the fact that the number of aerodromes and the planes and services of the domestic airlines are increasing, it is surprising that the freight carried by the Indian Airlines is going down. From 40,000 tonnes in 1961, it came down to 28,494 tonnes in 1971. This needs to be properly looked into by the IAC. The frequent strikes by the airline's workers resulting in cancellation of flights could have been one of the causes for decline in the freight. Businessmen could not be blamed if they did not utilise the domestic air transport more because of uncertainty in its operations. There may be also other reasons such as the freight rates charged or facilities made available by the IAC. Or is it that an assured fast-growing passenger traffic makes the IAC ignore air cargo? Or is it that it has not adequate fleet to pay greater attention to this side of business? □

Air cargo agencies

freight Private Ltd, le House, Nicol Road, rd Estate, Bombay.

erican Express Inter- nal Banking Corpora- Wenger House, Con- t Place, New Delhi.

iatic Travel Service, Box 1568, 12 Murzban Fort, Bombay.

cker & Co Private Ltd, rand Road, Calcutta.

ntinental Carriers, 37-H ught Circus, New

s. Cook & Son (C & O) P. O. Box 171, 4/5 First Beach, George Town, as.

& Kings (Agents) Ltd, Lloyds Bank Building, Bombay.

Freight Carriers Private Ltd, 43 Tamarind Lane, Bombay.

Gordon Woodroffe & Co (Madras) Private Ltd, 1/21 North Beach Road, Madras.

Govan Travels (Cargo Division), 4 Todarmal Lane, New Delhi.

Happy Travels Private Ltd, Century Bhavan, Dr Annie Besant Road, Worli, Bombay.

F. W. Heilgers & Co (Private) Ltd, 1 India Exchange Place, Calcutta.

Jeena & Co, 10 Veer Nariman Road, P. O. Box 849, Bombay.

Lee & Muirhead (India) Private Ltd, 12 Rampart Row, Fort, Bombay.

Mackinnon Mackenzie & Co Private Ltd, also trading as Pandair Freight, 16 Strand Road, Calcutta.

Manilal Patel & Co, Kamar Building, 38 Cawasji Patel Street, Fort, Bombay.

Mercury Travels (India) Ltd, Grd. Floor, Jeevan Tara Building, Parliament Street, New Delhi.

Patel Volkart Limited, 19 Graham Road, Ballard Estate, Bombay.

Peirce Leslie India Ltd, P. O. Box 565, Bristow Road, Willingdon Island, Cochin.

S.O.T.C. Travels & Tours, 44 Mint Road, Bombay.

Sanghi Travels, 7-E Jhandewala Extension, New Delhi-55.

Shipping & Clearing (Agents) Private Ltd, Great Eastern Hotel Arcade, 1, 2 & 3 Old Court House Street, Calcutta.

Sinclair Freight & Chartering Consultants Private Ltd, Wellesley House, 7 Wellesley Place, Calcutta.

Sita World Travel (India) Private Ltd, F/12 Connaught Place, New Delhi.

Skylark Travels Private Ltd, 114 Sahid Bhagatsingh Road, Colaba, Bombay 5.

Trade Wings Private Ltd, 30 Rampart Row, Fort, Bombay.

Tulsidas Khimji Private Ltd, 46 Veer Nariman Road, Bombay.

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Entertainment electronics

— A FEATURE

Marketing of radio receivers

R. R. Mahadeshwar

DIA is on the threshold of vast and momentous ex-ments in the field of tronics. A stage has now n reached when the sell- market in which the o industry and trade e registered remarkable gress all these years, is ning into a buyers' mar-

The production by the ufacturers in the small-e sector as well as the e sector has gone up by s and bounds, but de-d for radios has not in-sed in proportion to pro-ction. The buyers are now oming choosy.

this era of rapid techno-cal developments, a close y of the practices obtain-in this country and the ect idea of future trends required for successful keting. Nobody today deny the fact that keting on modern lines ssential if the industry is row further.

is a common requirement the marketing people to out the market needs for icular types of radio re-ers and to satisfy those ds with timely, well-con-ed, well-built and attrac-ly priced receivers.

n important aspect of keting is the need to y the customer psycho-. With the exception of a radio buyers from the l areas, the majority of them belong to the educated class and possess sufficient knowledge of everything connected with our this sophisticated product. Gone are the days when a radio could easily be sold on recommendation and persuasion. Market people would, therefore, do well to get detailed first-hand information relating to customer preferences, knowledge of customer reactions and the selling experience of the dealers and consolidate the information thus gathered from different sources and furnish it to the development section with a view to ensuring that the product is (i) based on trouble-free circuit and design and is in keeping with the latest developments in the industry; (ii) attractive and acceptable in appearance and (iii) competitive.

It must be noted that a pivotal role has to be played by the marketing people. The customer generally does not happen to know about the manufacturer. It is the marketing man in whom he fully reposes his confidence. It is, therefore, important for the marketing people to see that distribution channels at all levels faithfully guard this confidence.

The advertising agencies in this country have been using marketing research as a basis for developing and executing advertisers' campaigns. Consumer surveys, of course, form a basic foundation for such a campaign. In recent years, studies of advertising media include surveys of audiences reached by various income, age or other groups, geographic and city size coverage. In examining the export market, it would be most useful if international co-operation to some extent could be established in view of the fact that markets and marketing will differ from country to country.

The companies embarking upon export programmes would do well not to ignore this difference. There is a great scope for Indian electronic products in several foreign markets and the Export Credit and Guarantee Corporation as well as the Engineering Export Promotion Council have been playing important roles in furnishing information about foreign buyers and governmental policies of different countries. It is to be hoped that the Indian exporters will take full advantage of these opportunities.

There is also wide scope for marketing consumer goods in the rural areas. The marketing people would do well to go to the villages in the interior and tap new unexplored fields by educating the people in the modern advanced methods and their utility with the aid of effective publicity, attractive advertisements and frequent demonstrations.

Today, radio is the only means of recreation for the villagers and with the advent of transistor radios, those who have financial resources will cheerfully buy transistor radios. Besides, buying

Growth of the radio receiver industry

('000 numbers)

Year	Capacity	Production	Percentage utilisation of capacity (4=3/2×100)
1	2	3	4
1960	279.2	268.3	96.1
1961	279.2	326.3	116.9
1962	332.3	343.3	103.3
1963	390.3	418.1	107.1
1964	390.3	472.7	121.1
1965	391.5	583.4	123.5
1966	492.5	712.6	144.7
1967	550.5	854.1	155.1
1968	798.8	1,368.8	171.3
1969	1,214.8	1,735.5	142.9
1970	2,330.0	1,774.0	76.1
1971	2,330.0	1,949.7	83.7
Annual compound rate of growth between 1960 and 1971 ..	21.3	19.7	—

NOTE : Data pertain to the organised sector only.
SOURCE : Central Statistical Organisation, *Monthly Statistics of the Production of Selected Industries of India, November and December 1968, Vol. XX, Nos. 11 and 12, and January and February 1969, Vol. XXI, Nos. 1 and 2, and various issues*, Calcutta.

r Mahadeshwar is on the of Electronic Digest, *offi-organ of the All India io & Electronics Associa-*

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ıbits of the people have ıdergone a remarkable ansformation.

The marketing people ıould chalk out programmes r visiting the surrounding illages at least once a onth, with a view to estabishing personal contacts with .e villagers.

Audio-visual publicity will elp popularise radios in ıral areas where the bulk of the population is illiterate. Screening of films and slides in touring cinemas will be useful in popularising the product and making the villagers radio-minded.

The marketing people have the responsibility of discovering today the needs of the people for tomorrow so that production of consumer goods could be developed accordingly. □

Unhealthy reliance on foreign know-how

By G. K. Sanker

WHEN India won her independence there were ardly 15 broadcasting staions in this country and any of them were not very opular. The people were not adio-minded, and the costs of omestic radio receiving sets ere prohibitively high for ıe common man. Radio sets ere mainly imported. Added this, the puritanical policy the Ministry of Informaon and Broadcasting was ıch that many of the broadasting stations which were t up with higher-powered ansmitters under the five ear plans, were not catering the taste of the large majoty of the masses. Hence this ome entertainment medium as not effective.

There were one or two forgn stations to which people ostly tuned and listened ut the duration of their oadcasting in the Indian nguages being so very mited, this also did not culcate the habit of stening in the people. gainst these odds, the indusy had to find sales outlets a country economically underdeveloped. Besides, there were more pressing basic problems confronting the average family which would think twice before purchasing a radio set. Fortunately, this situation has considerably changed and at least the middle class people now have a set of their own.

With the invention of the tiny capsule called the 'transistor' the portable battery-operated transistor sets have become very popular during the past five years. This is a real boon to a country like India, where electricity is yet to reach many of her villages.

Though the actual cost of production (material-wise) is very low for transistorised receiving sets, India is yet to produce a stable and rugged transistor set with a good coverage for less than Rs 100, which should be quite feasible with the available resources and talents. The main drawback of this industry is the chain of tradesmen involved in retail distribution. They are so many and varied that the manufacturer thinks that he has to have margin to cover all the links in the chain. Further, the industry banks so much on foreign collaborators who want to make quick profit at as high a rate as possible, that the initial pricing itself is quite high. The purely indigenous manufacturer is not interested in availing of the services of the really talented and qualified electronics engineer since he has not got the foresight to view the things on a long-term basis. Many young enthusiastic electronics engineers in India have no place to serve this

Mr Sanker is president of ll India Radio & Electronics ssociation, Bombay.

PROFILE

Radio receivers industry

THE production of radio receivers showed a rapid rise after the Second Plan. In 1956, there were 15 manufacturers in the organised sector with a total installed capacity of two lakh sets per year, manufacturing 1.02 lakh sets a year. The restrictive import policy and the subsequent ban on imports of radio receivers gave a fillip to the development of the indigenous industry. Within a period of five years, the production touched a level of 2.80 lakh sets a year. Between 1960 and 1971, the capacity and production in the organised sector recorded an annual compound rate of growth of 21.3 per cent and 19.7 per cent respectively. The capacity in the organised sector is estimated at 23.30 lakhs and production 19.49 lakhs. For the past three years, the production has been somewhat stagnant. The production in the small sector is placed at about seven lakh sets per year.

According to the industry, today, one out of every 40 persons owns a radio set whereas a decade ago only one out of every 200 could afford that luxury. With the green revolution and flow of more funds to the rural areas, a vast potential has developed in that area. But the rural population can only afford low-priced sets. The demand of the rural family is for a simple, cheap, single-band medium-wave set which can receive popular programmes clearly. Therefore the industry has to lay emphasis on the improvement in the efficiency of the product and on reducing production costs. It is also necessary for All India Radio to have more powerful transmitters and to widen the range of its programmes.

India has achieved near self-sufficiency in radio components. The import content is claimed to be about Rs 1 per radio as against Rs 50 a decade ago. Sophisticated components such as gang condensers, valves and switches are also being produced in this country. There are about 1,200 ancillary units in the small sector supported by the radio industry.

The organised sector of the industry is perturbed by the steep rise in the excise on high-priced receiver sets. The excise duty for receiver sets of less than Rs 165 has gone up from Rs 10 to Rs 12 this year. For sets priced between Rs 576 and Rs 675, the excise duty has been increased from Rs 120 to Rs 160. For radio sets priced above Rs 676, the excise has been increased from Rs 133.33 to Rs 200. The manufacturers contend that this industry is one of the few where a relative measure of price stability has been obtaining all these years. Sales in high-priced categories which have been at a stagnation point are said to have slumped further.

Radios and transistors made in India are becoming popular in African, East European and Persian Gulf countries. The exports of radios and transistors are currently of the order of Rs 1 crore. There is no doubt that Indian radio technology has reached more or less a level where it can compete with international standards. But to improve its present performance the quality of the radio, particularly its finish, needs to be improved.

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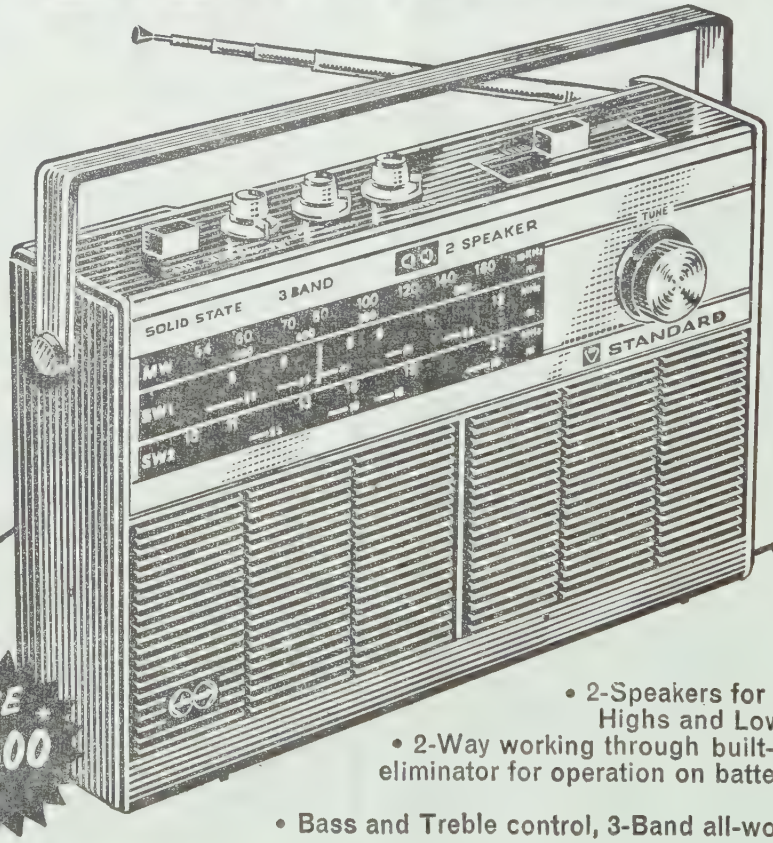

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ountry, and hence they go broad where they do well. n most of the cases the jobs re not lucrative to attract ilent and this state of affairs hould be removed at all osts.

The industry has attained a tage now wherein with its) years of experience in naking components as well s in assembling, mainly omestic broadcast receivers, must be able to stand on its wn legs without excessively aning on foreign technical now-how. In this respect it ill be beneficial to follow ne footsteps of Japan which as achieved remarkable re-ults in the field of manufac-uring domestic electronic quipment for entertainment s well as various other sun-ry electronic software. Un-ortunately there is pre-alent among the people of his country, a wrong notion hich may be termed as 'diffi-ence' in the technical com-etence of our engineers and technologists. This attitude should change. Our entrepreneurs must come forward to set apart a section of their profit which is to be mainly spent on developmental work.

There should also be a complete revision of the system of education in radio and electronics technology for instance, the syllabus and educational objectives laid down in IIT and other colleges are far above the requirements of the industry. After completing their training programmes students are found unfit for the electronic industry in this country and so they go abroad to seek jobs.

On an average over 30,000 radio-cum-cassette recorders are smuggled into this country every year, even though without spare parts, maintenance of such units here is impossible. In the interest of consumers smuggled radios should also be confiscated, like tape-recorders, to give protection to the radio industry.

Moreover a real talent search and encouragement from the industrialists is essential. If it is necessary to send persons abroad it must be done. Though the industrialist will always think in terms of securing a reasonable return on the money that he has invested, which is human and natural, he should also think in terms of the quality in product that he is giving the masses, who are unfortunately left with no alternative but to buy anything that is produced in this country owing to import restrictions.

In those cases where there are foreign collaborators, it must be seen that the importance of the collaboration agreement is minimised. Better still, collaboration should be completely terminated when the agreement comes to an end. When this is done it should be borne in mind that the basic machinery and equipment that are necessary to produce the hardware and software must also be indigenously manufactured. This will help various ancillary industries also. This is mainly the problem of mechanical engineers who manufacture mother machinery that go to help production of other machines. To achieve this there should be real co-ordination between the industry and the scientific institutions. The engineers themselves must have an understanding of various disciplines, and this inter-disciplinary approach should be a part of that training. A word of caution to the technologists and engineers: They must bear in mind the soil in which they are working and the drawbacks that they have to face collectively and individually. Whatever resources are set apart for technological research must be used very effectively so that the results will help this country. □

Entry into sophisticated fields

By H. S. Bhatty

SHORTLY after independence, the foundations of he radio receiver industry ere laid, per force owing to ack of technological know-ow, with the collaboration f foreign manufacturers. What should have been a ransitory arrangement, engthened out to 20 years, uring which no indigenous nnovation or development as possible. This, in histori-al perspective, is one of the mportant causes which tunted the growth of our lectronic industry.

With a handful of large ector companies monopolis-ing the radio field, prices of radios remained high; in fact an average radio was priced above the annual *per capita* income of an Indian during these two decades. It was the advent of the small-scale industry around 1960, which helped to radically change the situation by providing the necessary competition. Small and medium industries have generally been based on indigenous skills and locally-made components. The paucity of import licences and discrimination against these two sectors in regard to imports compelled them to resort increasingly to local sources of supply. This indirectly gave encouragement to the development of the indigenous component industry.

By 1965-66, the small industry rose to be a major producer of radios in the country accounting for a share of 55 per cent of the aggregate production. Subsequently, the favoured treatment shown to larger units by official agencies resulted in a backlash which literally stopped the growth of the indigenous radio receiver industry and finally put it into disarray. These are historical tragedies in the growth of the consumer electronic industry.

In recent years, the component industry has registered a fresh growth and kept in step with the requirements of the consumer industry at least. Other sectors such as defence electronics, telecommunications and specialised

Manufacture of electronic equipments and components

(In crores of rupees)

Year	Entertainment equipment	Defence equipment (BEL/HAL)	Communication	Other instruments, computers, etc.	Total equipment	Components	Total production (equipment and components)
1965-66	24.0	6.6	3.0	3.6	37.1	6.5	43.6
1968-69	48.0	21.3	4.7	11.0	85.0	21.0	106.0
1971-72	80.0	35.8	14.0	13.7	143.5	42.0	185.5
			(PLANNED)				
1974-75	225.0	60.0	20.0	55.0	360.0	105.0	465.0

Mr Bhatty is managing Director of Polestar Electronics Pvt Ltd, Bombay.

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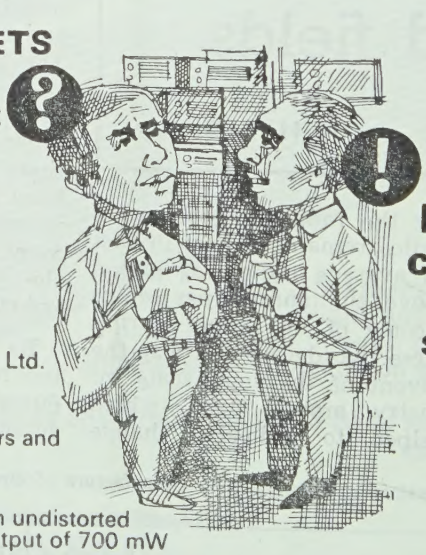

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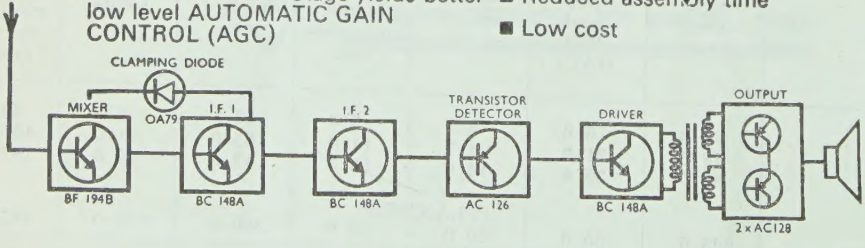

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ds like computers etc ve suffered from lags. It s the Bhabha Committee ich highlighted the need of t growth in these fields. plementation of expan- n programmes has been dy in the critical fields. A d-term review in March '0 at the National Confer- ce of Electronics at Bom- y came to the conclusion at, while consumer electro- s registered a phenomenal owth, the key sectors lag- d again. Perhaps, the for- tion of the Electronics mmission was a sequel to alisation of these defects.

When the commission took er, it was faced with a cision regarding the expan- n of the TV industry. The ge-scale radio manufac- rers, who had shunned dian know-how in the be- nning and projected the view that TV could only be produced with the so-called superior technology of foreign companies, were countered by the claims of CEERI, Pilani and the local small-scale industry which had tasted the bitter fruits flowing from foreign collaboration.

After a pragmatic analysis of all factors, the commission came to the conclusion that foreign companies should be excluded from the TV and consumer industries, and a major portion of production in TV, tape-recorders and stereos should be licensed to Indian companies, particularly those in the small sector. This policy marks a watershed in the Indian electronics industry and augurs well for its future growth which is expected to be very rapid. The accompanying table shows the past and targeted future growth in various sectors.

It will be seen that the consumer electronics industry has registered a cumulative growth of nearly 30 per cent every year between 1965-66 and 1971-72. This is expected to improve during the next four years. Other sectors are picking up, more especially the field of computers in which once again we were unable to register fast progress owing to discriminatory agreements with foreign companies. The 1971 war has changed the perspective and the Electronics Commission has now turned to the USSR and East European countries for tie-ups in fields where we require collaboration. Two high-powered teams of scientists and technologists have recently returned from study tours and are expected to submit recommendations of far-reaching nature.

In the 25th year of independence, with a production of Rs 2,000 million per annum in electronics, India has moved on to a launching pad from where the take-off will be smooth. From radio which has become an ordinary appliance, the industry is graduating into sophisticated fields of TV and computers instead of importing we are now exporting radios and electronic equipment and the projected free trade zone at Santa Cruz in Bombay is aimed at generating export business of Rs 1,000 million per annum within two years of its establishment.

In sum, the electronic industry can truly boast of formidable achievements in 25 years since this country won its freedom. □

Problems of components industry

By N. J. Kite

HERE are not many manu- facturers of good quality ctronic components in our untry at present. There can ll be good reasons for this, for example, high capital vestment that is necessary produce large quantities of nsistently high quality stan- rds to world specifications d high capital equipment dundancy that is to be pected with the ever im- oving new technologies. ese two factors alone derline the importance of ry high production figures ensure adequate capital re- n and to allow for possible ture obsolescence.

In India the component arket for 2.5 million to 3 million radios, say 100,000 TV sets in 1973, plus the professional and industrial field requirements does not provide very attractive production figures for the component manufacturers, particularly if the market is shared by many. Again, this may well be another reason why there is a shortage of good quality component manufacturers.

Yet if we look outside of India, the need for reasonably priced electronic components to international standards is enormous.

In most European countries and in the US, the cost of living has been rising steadily, with the result that the cost of production naturally, has, also increased, even though very high degrees of mechanisation have been employed. Particularly for the entertainment markets such as TV, radios for home and for cars, Hi-Fi stereos and tape-recorders, where prices are a significant factor, most European countries and the US have for some time been increasing their demand for electronic components from the East. In fact many assembly units have been set up in the East for entertainment equipment to take advantage of cheaper components and cheaper assembly costs. The equipments are shipped direct to Western countries. In Singapore alone, approximately seven million radios are assembled, outside of tape recorders and TV sets. There are other areas like Taiwan and Hongkong which have developed, along the same lines. Vast quantities of components are needed in these various assembly areas, and Japan, Taiwan, Hongkong and South Korea are the main supply centres.

There is undoubtedly room in this large market requirement for India to participate. To enable our country to enter the export market in all types of electronic components in a significant way, the following conditions are absolutely necessary. (1) The components to be exported must be of the type and of the right technology required by the world markets; (2) they must conform to world accepted quality standards, and must be rigidly quality controlled; and (3) they must be available at world export price levels, and the delivery dates strictly adhered to.

To achieve these objectives, the component manufacturer must be allowed certain facilities such as, (*a*) freedom to use the latest component technologies. If they are not available locally, he should be permitted to import the know-how; (*b*) freedom to import the latest technologically advanced manufacturing machinery; (*c*) easier expansion possibilities particularly where results prove the necessity; (*d*) easier strategic raw material import formalities; and (*e*) easier export formalities.

To do exports on a really large scale will require high capital investments and it would seem logical that those manufacturers, be they large, medium, or small-scale who are prepared to make such

Mr Kite is general manager, ctronic components and terials division of Philips dia Ltd.

investments should be invited to put up their project proposals to the government without delay.

If one assumes that only the larger manufacturers can make such high investments, then where can the small-scale manufacturers fit into the picture? Let us look at the Japanese system which has proven to be very successful. Here we see large manufacturers marketing through export houses. But these large manufacturers employ—and this is an important point—a very great number of small-scale supporters to make the raw materials and piece parts for the assembly of the final components. Most of the small-scale units in Japan have developed into medium and even large-scale ones just supporting those component manufacturers who have the expertise to make the final components and who have the knowledge in export marketing.

For the fastest advancement in any technological field, use has to be made of the best possible skills, know-how and enterprise. If a developing country wishes to attain these qualities all by itself it will take perhaps too long and in that period the rest of the world may well have gone even further ahead, particularly in technology.

No country can be self-sufficient in brain-power or even in raw materials. Knowledge must be shared and pooled, and for us in the electronics industry if we are to become a significant supp base in India for world ma kets we have to utilise all th expertise available, be it loc or foreign. The rewards po sible can certainly show profitable and very high ra of industrial progress plu significant foreign exchang earnings. □

India's exports of radio receivers

(Amount in '000 rupees)

Year	Domestic radio receiver sets		Transistor radio receiver sets		Other radio receiver sets (automobile)		Total	
	No.	Amount	No.	Amount	No.	Amount	No.	Amount
1968-69 ..	214	39	5,994	809	104	10	6,312	858
1969-70 ..	1,421	198	33,564	2,669	781	240	35,766	3,107
1970-71 ..	11,736	962	1,01,806	7,901	227	27	1,13,769	8,890
April-November								
1970-71 ..	11,733	962	46,650	3,517	49	13	58,432	4,492
1971-72 ..	132	36	1,70,186	13,991	90	20	1,70,408	14,047

SOURCES : 1. Reply to unstarred question No. 13 in the Rajya Sabha on November 15, 1971.
2. Government of India, Department of Commercial Intelligence and Statistics, *Monthly Statistics of the Foreign Trade of India*, Vol. I, March 1971 and November 1971.

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